SCIENCE

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THE APPROACHNG TOTAL ECLIPSE OF THE SUN.

THE plans of some of the principal parties from American observatories for the observation of the total solar eclipse occurring on the morning of May 28th are as follows:

The arrangements by the United States Naval Observatory have been made under the direction of Professor S. J. Brown, the Astronomical Director, and contemplate the occupation of three stations, two on the central line, and one near the northern limit of totality.

The first station on the central line is under the immediate supervision of Professor A. N. Skinner, and is located at Pinehurst, N. C. The party will comprise, in addition to the five members of the Observatory staff, associate members engaged in spectroscopic and other researches. These include Professor Ames of the Johns Hopkins University, and Doctors Dorsey, Huff and Reese, and other assistants from the physical laboratory of the University. In the photographic work Dr. F. L. Chase, of Yale University, and Mr. A. L. Colton, of the University of Michigan, will take an important part. The work at the station will comprise the establishment of the latitude and longitude, visual and telescopic observations and drawings of the corona; photographs of the corona with the 40-foot photoheliograph lens, the $7\frac{3}{4}$-inch visual lens belonging to the Naval Academy equa-

torial 114-inch focal length, two 6-inch Dallmeyer lenses of 40-inch focus, one of them provided with a color screen and a special Voigtlander lens of special construction of 4-inches aperture and 8-inches focal length, also provided with a color screen. The spectroscopic work, under the direction of Professor Ames, will embrace observations of the reversing layer and corona with a concave grating of 10-foot radius and rulings 6x3.5 inches, 15,000 to the inch, and a plane grating with rulings of the same dimensions used in connection with a quartz objective of 3.5 inches aperture and 60 inches focal length. A prismatic camera with a very transparent prism of 6 inches length and 5.5 inches on the face, and an object-glass of 4 inches aperture and 6 inches focal length, will also be used at this station by some of the observatory force, as yet unassigned. Dr. Dorsey will make observations on the polarization of the corona with an apparatus designed by himself, while Professor E. R. Wood, of the University of Wisconsin, in co-operation with other observers along the eclipse line, with an instrument designed by himself, will measure the velocity, distance apart and direction of the shadow bands.

The second station on the central line will be at Barnesville, Ga., under the immediate supervision of Professor M. Updegraff, assisted by five of the regular staff of the observatory. The operations at this station will be similar to those at the last in regard to latitude and longitude, and the observations of the corona visually and with the telescope. The photographic work will embrace photographs of the corona with the 40-foot photoheliograph lens, a 6-inch visual lens of 96 inches focus provided with a color screen, and a 6-inch Brashear photographic telescope of 80 inches focus under the charge of Mr. C. A. Post of New York, to whom the instrument belongs. Additional photographs on smaller scale will be taken with a 6-inch Dallmeyer, 33 inches focus, a 4-inch Dallmeyer, 17 inches focus, and a 3.5-inch Dallmeyer, 9.5 inches focus, provided with a color screen. The only spectroscopic work at this station will be photographs of the reversing layer and the corona with a slitless spectroscope, under the charge of Professor H. C. Lord of Columbus, Ohio, by whom it was designed and constructed.

The station at the northern limit near Griffin, Ga., will be for the study of the reversing layer and the corona, and will embrace observations with powerful gratings both flat and concave. Professor Crew and Dr. Tatnall of the Northwestern University will observe with a concave grating of 10-feet radius; Professor Humphreys of the University of Virginia, assisted by Mr. Dinwiddie of the same institution, will observe with a concave grating of 21.5 feet radius; while the grating objective will be used by Mr. L. E. Jewell of the Johns Hopkins University and Dr. Mitchell of Columbia University, New York. This instrument is identical to the one in use at Pinehurst. The two flat gratings and the concave grating at Pinehurst have peculiar and unusual qualities for the special line of investigation for which they will be used. The size of the ruled space on these gratings, and the peculiarities of the ruling, which throws all the light into the first order spectrum, gives a brilliancy to the spectrum which could not be attained by any practicable combination of prisms.

It happens that a large number of parties will congregate at Wadesboro, N. C., a situation which the weather observations for the past three years rather surprisingly singled out as likely to be favorable in its meteorological conditions. It is nevertheless unfortunate that these parties are not more widely scattered along the path of totality, so that fickle weather conditions should not affect all alike.

We have already described the plans of several of the parties at Wadesboro. They include one sent out by the British Astronomical Association, which successfully observed the recent eclipse in India; a group of observers from Princeton; a party from the Smithsonian Institution; several astronomers from the Yerkes Observatory of the University of Chicago, and a party from Vassar College. A great variety of observations will be undertaken by these large parties, the most novel of them being that of measuring the heat radiation of the corona during the ninety seconds of totality, by very delicate bolometers, which will be attempted by some of the members of the Smithsonian and the Yerkes observatory parties. Elaborate spectroscopic investigations will also be made, if the weather permits.

The Lick Observatory sends to Thomaston, Georgia, the well equipped expedition already described in this JOURNAL which plans extensive spectroscopic and photographic observations. Another California party, from the Chabot Observatory, will make numerous photographic exposures at Union Point, Georgia.

The party from Harvard College Observatory at Greenville, Alabama, will make a determined campaign with powerful appliances for the purpose of discovering an intra-Mercurial planet.

The Allegheny Observatory will send a party to Fort Deposit, Alabama, equipped with extensive photographic and spectroscopic apparatus as described in a recent issue.

Expeditions from the U. S. Weather Bureau and the Blue Hill Observatory will conduct appropriate observations at Newberry, S. C., and Washington, Ga., respectively.

With favorable weather conditions we may reasonably expect a considerable increase in our knowledge of the problems of the solar surroundings, which can be only studied during the brief interval of total solar eclipses.

THE PRINCIPLES OF SCIOSOPHY.

"The physical world is the world of illusions. The non-physical is the world of realities in matter."—*Aber.*

"The cell is an illusion: it is merely a word: thus it is with the body, so it is with the earth and with the solar system."—*Judge.*

A RED letter day in the annals of the Astral Camera Club of Alcalde was Saturday, April 1, 1900. On this auspicious occasion was delivered the fifth annual memorial address before this organization, and in this address, for the first time in the history of human thought, were clearly set forth the principles of the divine cosmic science of Sciosophy.

But science I should not say, nor yet philosophy. It is not wholly either, but greater than either. Child of both and parent of both, as the heavens surround and include the earth, so does Sciosophy surround and include all else within the thought of humanity. Sciosophy, in the words of the venerable sage of Angels, is that "ocean of knowledge which spreads from shore to shore of the evolution of sentient beings, unfathomable in its deepest parts, though shallow enough at its shores." Though Sciosophy may be new, its elements are not. Nothing in the world of mind can be really new. The 'stones of Venice' were stones of course, before Venice rose from the sea. They waited the builder whose magic touch should transform rock into palace, who from the marble quarry should draw forth St. Marks. Thus Sciosophy has waited its hundred centuries for the living touch of Abner Dean. Its basal ideas, the Greeks held, the Hindus and the Arabs, while the restful teachers of all climes have foreseen their wondrous possibilities. Under the wand of the prophet behold as an exhala-

tion of fragrant incense rise the astral verities of Sciosophy!

It was indeed a fortunate inspiration, (though I say it who should not) which came to the Secretary of the Astral club. The fifth anniversary of its foundation should be laid deep and broad and on it should be emblazoned its deathless principles. And these great truths at once astral and abysmal, deeper than the ocean and higher than the stars, who so fitting to set them forth as this great prophet of the western pines in whom the Orient has found at last its Occidental reincarnation?

This memorial address of Mr. Abner Dean, will be printed *in extenso* in the due fullness of the seasons. But in advance of the proceedings of the Astral Club, it is proper that this brief summary—however inadequate, should reach the waiting public—

"In boyhood's rosy dawn" began Mr. Dean, "I lived in Kennebunkport, Maine, and as I wandered over hill and dale, by forest and sea, my mind was occupied by questions of what may be and what might be in the universe, what its limitations really are, and whether indeed these limitations exist.

"My parents, practical Yankee folk that they were, said that I was dreaming, and doubtless they were right, for through my dreams I learned that the dream is the sole reality. It is one of the great world-principles that whatever I think becomes real with my thought. Thought is reality and the material stuff the vulgar call 'the real thing' is to the enlightened mind less than the 'baseless fabric of a dream.'

"For example," continued the sage of Angels, "I used to ask myself what I would do were there no law of gravitation? What if it worked in some way unknown to Newton's concept? What if I could myself alter it that it might serve my will? Then things would be very different from what they now are, or appear to be. So in my thought I made them different. How high I leaped in those days? How I gathered apples from the tallest trees? How I played shuttlecock with the stars, and carved my name on the silver-sided moon? For I understood as a child and contented myself with childish things.

"Then I turned to other supposed material facts or laws. What if friction were suspended, how I could slide over the curved surface of the horizon? What joy to hold the laws of combustion in my hand! What wealth could I turn one metal into another, or both into the primitive mind-earth-stuff or protyl from which all men and all metals and all dreams are made. O for the touch of gold, the bottomless mine of silver, the genius at whose astral enchantment all dreams come true! What if the stars could tell me their secrets, all that they have looked upon and all that has looked on them?

"As my mind grew more subtle I asked: What if the straight line be not the shortest distance between two points? What if 'the longest way around' be really 'the shortest way home'? What if space have other dimensions than length, breadth and thickness? As these three enclose matter, may they not need other three to enclose mind? Here I stumbled on the truth of the Astral body and the Shadow Phantom, as in other speculations I had touched on Alchemy and Astrology. And with all these I had wandered into the field of the celestial geometry, the mathematics that has no limit and as yet no name, the measurement not of land and lumber but of the astral spheres.

"Since those days I have wandered far from the shores of Maine, through scenes shifting and stirring, till in my old age I have come to rest under the singing pines. But through all these days my real life has lain in these problems and these questionings. When I laid down my pick and

shovel on the banks of the green Stanislaus, I came to the true meaning of reality. Out of my boyish guessings as to what I would do were things that we know other than what they seem, or were things we know not clear before our eyes, arose at last the majestic cosmoid of Sciosophy. As material science works with microscope and scalpel or with pick and plow, so must spiritual science work with the finer tools of astral thought in its analysis and synthesis of the fundamental entities of creation. And these tools and methods do not soil the hands or materialize the soul.

"Speaking of Speculative Philosophy (which is an inchoate branch of Sciosophy) a distinguished adept of Boston has wisely noted its superiority over the 'gutter-psychology' so largely affected to-day. For as he says, such study brings no contact of the soul with vulgar matter. It 'does not soil the hands' nor blunt the sensibilities, and its reflex effect on the mind is purely one of etherization. For this reason he especially commends the study of Speculative Philosophy to thoughtful people of leisure and especially to cultured women. And surely the whole face of science and philosophy will be changed when it falls into the fair hands of the leisurely etherealized 'Eternal Womanly.'

"It will be seen that the study of Sciosophy is at once the complement, the opposite and the antidote of the study of material science. Its first principle is this, *Matter rests on Mind.* On mind it is dependent for its recognition which is its existence. Its laws are mental channels merely, the grooves into which the thought sustaining it most naturally falls. With your own mind you can cut such grooves, can make such laws; therefore do it! This will exercise your highest powers, the powers we call astral or star-born, because in all the visible Universe nothing can rise higher than the stars and nothing works so persistently as they in their quiet astral fashion.

"Would you change the law of gravitation? Then change it! You have but to assert yourself. If you have the courage to try, it is nothing to remove mountains, as men once did of old, as men still do who live upon the greatest mountains that there are. To remove their astral phantoms is the first work of the mind. When these are gone the material mountains crumble away into shapeless granite sand.

"But you may fail when first you try your eternal powers. Doubtless we are all feeble on the astral plane. We have lived on the material plane so long, with our eating of beef and our scramble for gold that the divine Karma has grown weak within us. We know not the powers we hold and we dare not put them to the test. So we buy our tickets on railway trains rather than flutter the pinions of the soul. We yield to the domination of matter and force when we should bring matter and force as humbled servants to our feet. We search far and wide for the useful and we miss that which is above all use, perfection carnate, incarnate and re-incarnate, the astral Karmal aura of the soul!"

After portraying in such fashion the value of effort which has its beginning, direction and end within the circle of volition, and after showing that the Karmal powers should be spent on the imponderable astral body, not on the dull muscles designed only as its refuge and shield, Mr. Dean returned to the basal principles of Sciosophy. These are, stated categorically as follows:

"1. Truth exists only in terms of human experience. 'The thing we long for that we are.' This accords with Lessing's Dictum. 'It is not the Truth but the search for Truth for which Man searches.' In other words Absolute Truth exists only in the Absolute expression of the Universal Mind.

"2. Whatever is true to me must somehow come into my thought; I must think it else it is not true. This accords with the great axiom of Descartes—'I think, therefore I am.'

"3. Conversely, what I think is true, which is therefore true to me is part of the Universal Truth. This follows from the discovery of Bishop Berkeley, that one thing is as real as another if as clearly apprehended, and its application to all things brings the Universe within the transcendent domain of Sciosophy.

"Through all the ages, men have striven to carry thought into action. All thought which cannot be thus treated, men have scorned as unpractical. They cannot use it in their business, therefore they will have none of it. But a higher aim is to carry action into thought, to bathe sensation in cognition, to dissolve low actuality in the Nirvana of the higher possibility.

"To this end man should believe all things, the impulse from within as well as the impact from without. No dream is too fair, no speculation too bold, no hypothesis too hazardous, no sensation too weird for the wise man's acceptance. The more occult beliefs he has, the greater foundation for higher astral credence. The courage of acceptance is the glory of Sciosophy.

"In all this one danger first arises. Beware of all Authority, whatever its name or nature. Whether it comes with the sacred sanction of religion or with the strident tongue of material science do you ever reject its claims. Trust no assertion, no convention, no tradition, no investigation. Whether it be the council of Nice or the Royal Society it is the same to you. What men have agreed upon has lost its occult value. Its efflorescence has perished in the dust of compromise. Only heresy is truth. The conventions of man, whether of priest, scientist or clodhopper, hamper the soul alike. Shun Science, shun Orthodoxy, shun Wealth. These be the trio of deceivers who have stolen the birthright of man. These be the sisterhood of delusions who linger cloud-like between humanity and the Karmal light of the ever-toiling stars.

"The evil of Orthodoxy whether of religion or science lies not in its beliefs but in its methods. It subordinates the soul to objective, collective beliefs to which it arrogates the name of Truth. Its teachings, indeed, for the most part, are consistent with Sciosophy. The evil lies in its fetters. The orthodoxy which does not bind you may be indeed precious. The orthodoxy of Ceylon or Baluchistan you may accept without reproach. If you do not understand its principles as its followers interpret them so much the better for your acceptance. From its occult meanings, you have a wealth of new ideas in store. The Hindu Orthodoxy will be as rich to you as the principles of Westminster to the convert Hindu Sciosophist.

"New ideas only can be made true. Only the will created the world out of nothingness. Only volition enters at the gate of Nirvana. What men have asserted, that is dead. The schools, the churches, the laboratories all deal alike with the dead. With the dead there is no reincarnation into Life's fruitage.

"To untrammeled transcendentalists, wherever banded together, we must look for the red vintage of the future. These be the brave souls who scorn matter and matter's laws, who rise above matter's method. These be the Mahatmas of our sceptic age, the reincarnation, in Psychic Society, in Karmal Club, in Astral Association and Atmal Initiates, of the Djinns and Giaours of the past. In their hands time and space will lie at last like facile wax, and the tales of Odin and Minerva, of Thor and Jupiter, of Gautama and Manitou, all that we modern weaklings, belated eagles who have lost our wings in the hu-

man barnyard, have called Mythology, it shall be theirs to recall.

"'There were giants in those days,' it is said. There shall be giants again. Not in bodily size perhaps, for the body of Goliath was a cumbersome shield of a dwarfed personality, but giants in power, demi-gods and archangels whose lightest thought shall shame all Science's boasted action.

"And right here in Alcalde, green crescent of the sun-kissed hills, now at the end of the longest, darkest, noisiest and most helpless of all the centuries of time shall the lost life begin again, the lost mysteries of the human priesthood be recovered, the lost aureole of man's youth become the glory of humanity's ripened age!"

This gracious remark led Mr. Dean to extol the pastoral beauties of Alcalde, which of all our towns most resembles in its setting the clustering deodars of Kapelvastu in the Hindu-Oudh, where Gautama was born.

This comparison was suggested, no doubt, by a remark of the secretary (though I say it who should not), who likened his own fair hamlet on the Stanislaus to an abode of Mahatmas on some velvet green meadow, above a Himmalayan gorge, rich with hidden treasures of thought and gold, while above both alike rose 'the great silent wonder of the snows.'

But he soon turned to other matters and closed his eloquent address with a classification of the lines of thought which radiate from Sciosophy.

Taking the strange science of Quaternions as an illustration Mr. Dean demonstrated its basal assumption that in astral space a straight line is the longest distance between two given points. All other lines are consequently shorter and from this discovery, mathematics divides into two sciences, and the new science brings into the world a vast play of mental activity and a gigantic array of unsuspected truths.

"By the same method, we have only to assume that some part of the body material or astral is more sensitive than the visible eye or ear. From this discovery arises the vast science of Telepathy or more exactly Telepathology. The central fact of this science rests on the extension of the aura of the sensator across time and space to the astral eye or ear of the sensatee. By this process, all manner of suggestions may be transmitted, and these over any distance or through any time. It is as easy for example for me, as an adept, to speak to Marcus Brutus, through Telepathy, as for me to speak to the Lama of Thibet, and equally easy for Plato or Ptolemy to speak to me Through this power I may yet dissuade Brutus from his awful deed, or save Cæsar from that ambition through which fell emperors and angels. Knowing this, the whole significance or Sciosophy of history must be re-written. Nothing comes ever too late in time and the great tangled fabric of the past is ever open to reconstruction.

"To continue such investigations we may further assume that any supposed law of nature is something different from what it appears to be. *A definition creates a new science.* Thus if we transpose the law of heredity we give to the ancient wisdom of Reincarnation, and the transmigration of the astral ego, all the perpetuity which in scientific circles through like methods is ascribed to the 'Germ Plasm.' The vast range of phenomena commonly classed as 'Reverberations from the Monkey State,' or 'Echoes of the Fish Existence,' finds in reincarnation a simple explanation. Even past reincarnations are never fixed; all that is or was or shall be lies open to our volition. It is one of the great charms of Sciosophy that with each new dictum accepted, we have a new series of conciliations and explanations. And the perfection of each of these makes good the hypothesis with which we started and forms the basis for as many more.

"Reincarnation thus once established as a fact, it is easy by a little further hypothesis to trace the progress of individual souls in their flight through history, as well as the telepathic influences which other great souls born and unborn have upon them. Their victories and reverses are open to our eyes, and from these the laws of soul-growth each initiate may establish for himself.

"By the finest Sciosophic studies, the author of 'How Souls are Educated' has traced the ego of Alexander the Great from its first incarnation in the wilds of Crim Tartary, to 'the Jewish hermit adept called Jesus,' thence to Alexander, Alaric, Charlemagne, Edward the Black Prince, Henry VIII., a Cornish fisherman, an African king, a Staten Island carpenter, a Harvard senior, an explorer in the Persian Alps, his soul-ripening being finally complete as 'Old Mountain Phelps the hermit guide of the Adirondack Forest'; thirty incarnations in all from crudity to perfection.* 'But one more necessary experience,' it has been shown, 'awaits his soul—that of womanhood.'

"It is easy to demonstrate through these strange changes that up to a certain point souls develop as wild vegetation does by the action of laws external and internal and their own inherent instincts. Then as a gardener takes a wild-crab tree, prunes, cultivates, trains, nourishes, plants its seed in different soils, until he has a fine fruit good for human use, so the gods take a soul, train and prune it until it is fit to nourish by example and precept the souls of other men and to pass by our earth. The soul of Alexander the Great, on leaving the body of Henry VIII., passed under the immediate care of the gods, and the fourth phase of its existence began, the phase of purification, for as a fruit may rot because of too much sunshine, so may a soul, and all rot must be purged away.

* 'Education of Souls,' 1893, p. 17.

"Another ego, whose gyrations have been traced and placed on record, begins the soul life as a woman, the savage wife of a savage. She dies in the forest; reborn she dies in the slums; then in a convent; then at the stake, one of the martyred Waldenses; then a grand lady slain in a feudal castle. She is reborn as St. Elizabeth of Hungary and again as a great lady who is by no means a saint; next she is Milton's daughter, Dorothy; and to-day she is alive and within the United States, perhaps indeed the very reader of these pages undergoing the pangs of her final transformation.

"'The companion-soul of St. Elizabeth' says the gifted author above quoted, 'was the husband of her first two incarnations, in the latter of which she abandoned his children before his body was cold. In the third she did not meet his soul until after she had begun her infamous life. When they did meet, his efforts to save her were pathetic but unavailing. In the fourth he was her father, the gardener, and it was his love for her that drew her to his house, a better place than she deserved or could have entered but for his love. In the fifth he was the pastor of the church to which she belonged, and it was his teaching that gave her courage to die. In the sixth he was the baron, in the seventh the king, in the eight the lord to whose death she was a party and whose children she threw into the river. Thus far this soul, although it has had hundreds of incarnations and a wide range of experiences, has watched over the soul of St. Elizabeth and tried to help her in nine of her ten incarnations.'"

"The soul of William of Orange, it has been discovered, is 'now in the body of a boy 4 years old (in 1893) in the state of Connecticut,' while 'Richard, the Lion-hearted, is a little boot-black in New York City.'

"'Each world in the great belt has a soul and between the smallest moon and the

greatest sun, these worlds vary as do the souls of men and may similarly become extinct through weakness and debasing passion.' 'The bodies of lost sun-souls are called comets.' 'The cry of a lost sun-soul,' the comet-shriek is 'the most terrible sound that ever rings through the great belt.'

"Through such studies as these a vast literature has arisen, but it is a mere drop in the bucket as compared with the possible. When men shall realize the basal principles on which these discoveries rest, the reincarnational and recessional history of each man and woman who has ever lived, with all its hidden meanings shall be given to the world. And by the same token, each man and each woman who has ever lived shall re-write the history in his own fashion, for in Sciosophy, the past, like the present, must depend solely on the point of view.

"Still another line of investigation is this. In those fields in which the material senses, teach us nothing, we may create facts and laws of our own volition.

"Thus Chamisso and D'Assier have given us the laws of the Spontaneous Activity of Shadows. Mr. William Q. Judge has shown us how the Astral Ego may 'overcome the natural illusions of Devachan,' and how Yuga Kalpa and Manvantara may complete the great Astral cycle of Avatars, reaching at last the exploding point at which is caused 'violent convulsions of the following classes: (a) Earthquakes, (b) Floods, (c) Fire, (d) Ice.' Through these methods the thought movements so scientifically demonstrated by Mr. Thomas Jay Hudson have been laid bare. Similarly etheric vibrations become words or things under the puissant hand of a Blavatzky, or the flowing tongue of a Besant. In this manner, the natural history of spooks, wraiths, and night-followers has become matter of fact, and the laws once established in thought must remain, for science has no power to controvert aught but ponderable masses of matter. It will be seen from this that all myths are true, while all records of human achievement contain the element of myth. This gives zest to the Higher Criticism whether applied to Homer, to Daniel, or to William Tell, and endlessly varied are the truths which may be drawn from it. In like manner to Egyptology, Anthropology and even to Philology, the same methods are daily applied and the more ancient the line of research, the broader the harvest of its modern aftermath. It is through a consistent application of the methods of Sciosophy that Lombroso discovered the marks or stigmata that distinguish the genius, the degenerate, and the fool. It was Sciosophy that made Hegel a philosopher, Beaconsfield a statesman, Flammarion an astronomer, and Wilberforce a saint. Sciosophy plays about the doctrine of Heredity and the Ghosts and Night-Followers (Gjengängere), of Ibsen, the spasmoids of Sarah Grand, the grotesques of Poe, have taken their place among astral realities. Our pathway is blocked by apparitions of lost sins, our wisdom balked by the frivolities of our forefathers. Or should we care to relieve the darkness of this picture, we may sweep all these obstacles away by the angel wing of the inherited virtues of our long vanished grandmothers. Or if we turn our attention from the broken lives of grown up folks, we may trace similar influences at work in the play of children. The child loves the swing's refreshing sweep, because ancestral children lay in the ape's treetop cradle. The child likes to sleep with the cat because the touch carries it back to the race's ancestral childhood when the maternal furry tail curled round the infant lullaby.

"Even the staid sciences which call themselves exact may be made to effervesce under the touch of Sciosophy. We may change the chemical elements. We may photograph thought. We may analyze the

color of a sound. The painting of the invisible, and all the marvelous sequel of Röntgen's wondrous demonstration bear witness to this. To be sure, the shadow picturing of Röntgen rises not above the material plane but its suggestions have opened the gateway through which the universal aura is divulged. The correlation of forces has led the way to the discovery of the hidden meaning of elasticity and the conservation of forces shows that the elements we know are only latent oxygen.

"The societies for the study of flowers through the opera glass, of stars in mirrors, of the signals of inhabitants of Mars, all rest on a broad basis of Sciosophy. The gifted author of 'How to Study Birds Without Knowing Anything About Them,' has taught us the value of Sciosophy in matters of common observation.

"In the study of human politics Sciosophic hypothesis has disclosed wonderful vistas of the social future. Men's dreams of the 'City of the Sun' shall dreaming men make real. Toward this end the struggle of the social reformer must tend. The effort to abolish legislation, the effort to make legislation universal, to own everything in common, to own nothing in common, to own nothing at all, to destroy all nations, impartially, by repealing the charters of their existence, and to extend the power of our own nation so that all nations in the world may come under her domination, all these movements tend in the same direction, the recognition of the unreality of external things. Only through such recognition can universal peace and happiness come about. If a single mode of taxation, a single article of diet, or a special form of ballot, will bring this for you, then adopt it and strive for it and behold it is yours. In other words, the perfection of being is within us, and to reject all that seems to be while struggling for the unattainable is the sole price of social rest. When each man has the happiness of which he dreams, he will have all the happiness he deserves. To attain this lies with him and with him alone.

"Not less charming than social Sciosophy is Sciosophy applied to medicine. In general disease is due to dislocation or wandering of the Posthom Phantom or Astral Shadow. When this is at rest the currents of the body flow in peace. As to immediate causes of disease, there are many theories, and all are true so far as they go, but in Sciosophy all permanent remedies have found their justification. The old dictum that 'like cures like' is purely sciosophic in its orgin, as it can rest on no material induction whatever. The same is true of the theory that 'every part strengthens a part' and that 'heroism demands heroic remedies.' As the body is the fabric of the mind so through the mind the body must be reached. Through the Manas or mind alone can the dislocated Astrum or Linga-Sarira be adjusted to the Rupa or body, which it was made to fit. This readjustment depends on the will and the will has been jarred into action by many different influences. Contact with Kings or with bones or even with the garments that Kings or bones have touched or worn, has produced this result. Not that the aura of a King is more potent than that of a cab-driver, but that the impression of Royal Power is strong on the human mind, and the jolt that this impression gives may shock the shadow back to its place. A similar jolt is given by the modern necromancy of a popular cult in the art of healing. The nature of this action is clearly expressed in these words of the famous adept to whom the discovery of the secret of phantasmal dislocation was once vouchsafed. 'This cult' says the 'Mother' of the sect, 'demonstrates that the *patient who pays whatever* he *is able to pay for being healed* is *more apt to recover* than one *who withholds* a slight *equivalent for health.*' Hence

this adept goes on to observe, her initiates are 'not indigent and their comfortable fortunes are acquired by healing mankind morally, physically and spiritually.'

"But right here is the greatest danger of all Sciosophy. Its precepts must never be sold for money. Once turn your dreams into coin, whether as novelist, poet, phrenologist, palmist, pulmist, horoscopist, astrologist or medicine-man, and all their sacredness disappears. The precepts of Sciosophy exist in endless store, boundless corollaries of unfettered hypothesis, but to convert them into gold is the Midas touch that works their degradation. To appeal to the principles of Sciosophy for hire is to become an empiricist, a quack, a leech, a vampire, to be everything that is lowest on the earthy chain, the lowest of all planes. It may be true, indeed, that he who pays most for his astral healing is likely to be soonest cured, but the pay degrades his astral healer. The adept who never touches earthy pay is the one most likely to be exceedingly rewarded, for the true reward is within himself.

"The Sciosophist who serves men for coin, does it at the sacrifice of his own soul. 'Before a soul can pass to life beyond our planet,' says a noted Mahatma, 'it must unroll the long coil of its incarnations and look itself in the face.' To have made a living by charting of skulls, or mapping finger tips on a basis of sciosophic inventions, to have cured diseases by faith or hope or the laying on of hands, to have cast horoscopes for money, or laid bare the secrets of the future through the light of moon or stars, tea-grounds or broken tea-cups, to have found gold or coal or water by witch hazel rods, rain through atmal incantations, or love through postage-stamp flirtation, all this is prostitution of a heaven-born gift. The soul of the sciosophist who has done such things dare not, when translated, look its past in the face. It must seek blindly a new incarnation, the lowlier the better, that it may start again free from temptations which assail the gifted and the great.

"The author of 'Body, Mind and Soul,' in a sciosophic trance, once saw in Devachan the soul of a famous adept, who, in his seventy-eighth incarnation, had 'acquired a gift of second sight and through it has acquired a comfortable fortune by healing mankind' in an elegant office in Chicago. His soul after physical death is thus described:

"A man six feet tall and fairly proportioned, who during life in the physical body claimed the friendship of a few of the world-famed great, when seen a few months after death had a tall frame. About a year later, he had arms and legs shrunken to about the size of a dog's legs; and the body shrunken, but still large, was carried on all fours; and the head had become of the shape one might imagine a cross between a dog and an alligator to produce; and the huge jaws were stretched in vain to make a sound of any sort. The soul of the man was encased in this hideous non-physical body, and readily recognized the writer. Two years later, this soul was seen near the fifth descent in the caverns; and the non-physical body which it had lately left was roaming about the first zone, a huge, lean, hungry alligator-dog, which preyed like a vampire on the vitality of any man to whom it could get access.

"It is easy to see from this that the sciosophic adept on his way to Nirvana gains nothing from a 'comfortable fortune,' wrung from the hopes and fears of men and paid for from the crystal aura of his own soul, the upper triad of Atma-Buddhi-Manas, the only thing in a changing world which is worth hoarding to you or to me.

"No, no, truth is within you, life is soul growth, wealth is wealth of the mind. Kamaloka, the place of desire, is not an elegant

office in Chicago, or a Fifth Avenue home. Midway between heaven and earth it lies, and as your desires are so your future shall be. Whoso shall sell his dreams for lucre makes base coinage of his soul, and as I urge upon you the transcendent glories of Sciosophy, so do I warn you against Sciosophy's degenerate double, which is 'Humbug.' And as Sciosophy brings wealth above all vain imagining because it is Wealth of the Soul, so does Humbug bring soul poverty below all conception. You will know Sciosophy from Humbug by this mark and perhaps by this alone, that *Humbug pays*, and among all grades of Sciosophists as in all ranks and classes of men, Humbug has its Initiates, its Adepts and its Prophets!"

David Starr Jordan.

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*THE SOCIOLOGICAL STATUS OF THE PHYSICIAN.**

In preparing this address I have liked to think of it as a possible preface to chapters which other men, who love their work and to whom it is a profession of faith in a purpose of usefulness, and who are wiser and more apt than I, might write; for the relations of the physician to the social problems of his day and generation, while individual in their character and single in their purpose, are capable of manifold expression.

The term 'sociology,' first used by August Compte† less than sixty years ago, may be briefly and broadly defined as 'the science of the laws of human relationships' and, as often happens in the presence of cognate intellectual processes working toward the same end, the suggestion of a concise definitive appellation furnishes a rallying point to which the various workers converge and from which they go out, strengthened by a sense of companionship and encouraged to more extended effort by a better comparative knowledge.

The title sociology, therefore, beginning with an application in terms of positive philosophy, has come, in the short period of half a century, to include not only theories as to the organization of society, but practical considerations of the value, the application, the use, the control, and finally the prevention of certain social conditions.

The range of sociology, in its modern form, may be said to extend from investigation of the power value of psychic phenomena in the unit, to consideration of physical economics in the mass.

The original ideas of society as the product of extrinsic causes or of society as a force-aggregation upon a materialistic basis, have gradually given place to a recognition of the continuity of the ethical idea in an aggregation of human units, the majority of whom are relieved, in whole or in part, from the demands incident to a primitive struggle for existence.

It is precisely at this point in the development of sociology that a member of the body politic, who has long existed and who has indeed for several centuries had a definite sociological status, becomes an increasingly co-operative factor.

The science of society which has come in the growth of its responsibility to the human mass to find the need of a more accurate study of the entity of the human unit, turns to the doctor of medicine for advice and counsel.

To the members of the medical profession, whose devotion, primarily, to the needs of the unit, leads them to concentrate their energies upon a succession of individuals and who, consequently, find themselves isolated more or less from the social community and placed apart as specialized workers, the newer and broader sociology brings, not only the stimulus of association and sym-

* Delivered before the Congress of American Physicians and Surgeons, held at Washington, D. C., May 1, 2 and 3, 1900.

† Cours de Philosophie Positiv, 1842.

pathy, but larger opportunities for the exercise of their usefulness.

As a natural result of this approximation, appreciation grows, barriers of prejudice are broken down, the conventionalities of self in which pessimism is nurtured disappear, and men of different walks of life come to understand each other better, in the light of a common purpose to helpful ends.

The sociological status of the physician, therefore, at the present time, may be said to be his standing in regard to an extensive movement in behalf of the study of human relationships with a view to a truer comprehension of their normal bases and to the betterment of their existing conditions.

Before proceeding to a consideration of the effectiveness of the doctor of medicine as a part of the social organization exhibited through the medium of the institutions with which he is particularly related, and of the other duties of which he is capable and which lie before him, it will be well to consider briefly the character of his professional training and its reactionary effect upon himself as a man and a citizen.

Of all special educations that of the science and practice of medicine, when it is of the best quality, is the most exacting and makes the largest demand upon the staying power of the student; it is longer in duration, more confining, and requires more intense application than the corresponding courses which lead to a degree either in law or divinity, and affords a larger suggestive opportunity for collateral scientific reading.

It implies, in its beginning, the combating of natural repugnancies, and, in its continuance, a ceaseless struggle against the mentally depressing influence of daily contact with disease and dissolution, it challenges lofty sentiments and lays bare the framework of cherished emotions; on the other hand, it demonstrates truth and gives the foundation for a faith which, though usually silent and often circumscribed, nourishes the optimism necessary to this vocation, and helps the doctor to regard the affairs of life in the light of their importance, not to himself, but to the individual whom for the time being they most concern.

That the 'outward profession of faith' is not usual in the medical profession is due not to the lack of this quality, but rather to the reluctance to make public expression on the part of men whose life is, in its practical exhibition, largely confidential, and who, moreover, have especial opportunity to give utterance to the spirit within them in human contact work.

To the claim that medical education furnishes the material for a deep and lasting faith in a creating and sustaining power may be added the claim that it tends to beget that sense of reverence of which Benjamin Kidd says "that it is a preponderating element in the type of character which the evolutionary forces at work in human society are slowly developing, and with which are tending to be closely allied the qualities of great mental energy, revolutionary enterprise, powers of prolonged and concentrated application and a sense of simple-minded and single-minded devotion to conceptions of duty."

That attributes such as these may be nurtured in the stern curriculum of a medical education and fostered under the exacting conditions of a career which is both a practical application and the continuance of that education, we know; but it is also well for us to know, daily, that the possession of a most intimate knowledge of human life and its relationships implies an enormous moral responsibility.

In addition to the justly economic purpose of following a reputable vocation likely to ensure a livelihood, the principal incentive to the study of medicine is a purpose of usefulness, or a basal sense of a desire to express in some way the appreciation of an

obligation, a purpose which is the underlying motive of all sociological effort.

Coupled with this is the desire for a more intimate knowledge of the purposes of living as expressed in terms of accomplishment.

In addition to these motives there is that which comes from the possession of a truly scientific spirit seeking the acquisition of knowledge and the establishment to mental vision, of a utilizable truth, with a view, not to any individual aggrandizement, but to the end of making this a stepping-stone for further progress; this sequence of stimulation usually carrying with it the sentiment that the work done is a contribution to the general welfare.

In the very beginning of his studies the medical student is brought into investigatory relationship with that which he has heretofore thought of as an entity, a being, a mystery, and which, now put into his hands for demolition, he finds to be a most wonderful and delicately constructed machine, in the study of which he may be said to pass through much the same process of mental evolution as that attributed by Professor Giddings to primitive man. *

He is lost in marvel at the compact arrangement of muscular tissues, regards, as might the explorer of a buried city, the system of canals which carry quickening fluid to the outermost circumvallation and of drains into which are cast waste matters to be discharged without the walls; while the glistening white lines of nerves sending their branches in a network between muscles and under and over canals and drains, reveal to him the suggestion of a system for the communication of intelligence and the issuance of governing mandates to which the combined telegraphic and telephonic services of the greatest city built by human hands have no comparison in relative extent or in perfection.

* F. H. Giddings, 'The Principles of Sociology,' Anthropogenic Association, p. 246.

There is probably no point in his career of so much initial portent as that in which the student, in the dissecting-room, for the first time lifts the wet sheet from a face that he has never known, but behind which there dwelt, and through which there have been expressed, all that emotion and desire can crowd into the compass of a human life; it is a period in which he either consecrates himself or turns back; if he be honest he does one or the other; if he be a pretender he may, it is true, continue and complete his medical school course and go out into the broader school of work, but without the consecration he will inevitably fail of his highest possibilities as a physician.

The impress which is made by the study of anatomy upon the truly thoughtful man cannot but be emphasized in the physiological laboratory, where the student learns the values and uses of the different parts of the human machine and finds the answers to questions which the previous study of the structure of the silent body have evoked.

Here and in the associated laboratories he learns the chemical processes of the body in health and disease, the supplementary relationship of the different organs, the provision for their maintenance and repair, and comes to recognize and to know the functions of the microscopic organisms with which the body teems.

Carrying with him the lessons born of research, he next passes into the wider school of clinical teaching, and learns at the bedside that he has to study something more than the disease and that to render the fullest meed of service as a physician he must come to know, patiently, tenderly and, in the broadest sense, sympathetically, his brother man.

Here, too, he learns that his own feelings and emotions must be subordinated to the one purpose of his greatest help efficiency; that here, as in all scientific work, his personal equation must be reduced to a mini-

mum and that he must lose himself in the effort to think wisely and judge well for others.

In former times, not many years ago, the bedside teaching was provided under a system corresponding to that of apprenticeship in trade, and the student gained his clinical experience through association with some active general practitioner; but to-day, with the aggregation of population in cities and the consequent establishment of hospitals, these institutions are made to furnish the clinical material necessary for instruction, thus fulfilling one of their important obligations to the community which supports them; for while the first purpose of the hospital is to provide for the care of the sick, no such institution does the just measure of its work unless its benefits extend beyond its walls through the education of those whose lives are to be pledged not only to a warfare against disease, but to an effort toward its prevention.

From an economic standpoint the hospital may be defined as an institution in which capital and skilled labor combine to provide such members of the community as are temporarily disabled and without means of support, with the maintenance and care which shall fit them to become again self-supporting and active community factors.

It is a free repair shop for human machines, and the capitalist who contributes to its support does so with the basal, though perhaps not with the defined understanding, that his contribution is returned to him, through the community, in the lesser number of incapacitated and dependent machines, while the physician who furnishes the skilled-labor contribution finds his return not only in the same manner as the capitalist, but in the opportunity which is given him of fulfilling his duty to humanity with less expenditure than if he did it at his own charge, and with better effect, under conditions which inure greatly to his own well-being and usefulness.

But the hospital of to-day is something very much more than a mere repair shop; it is a school full of object-lessons in the application of those qualities which are the uprights, the girders, and the binding-rods of the modern social structure. In the first place, it is the most absolutely clean of all human habitations, and the present splendid successes of surgery in the amelioration of suffering and the preservation of life are due not only to the application of trained skill and intelligence, but to its operations under conditions of absolute sterilization which are microscopic in their minuteness.

Not only is the hospital a lesson in physical cleanliness, but, if justly administered, it is morally clean as well; for so important is its service, so often does the issue of a life depend upon the observance of some apparently minor detail, that its work must be done under the strictest discipline; order, obedience, alertness and complete devotion to the duty in hand must be commanded within its walls.

Under such responsibilities the position of superintendent of a hospital is a serious one, calling for administrative ability of no mean order.

Gradually with the growth of urban hospitals these posts have come to be filled by selected men who, from previous education, along other than medical lines, or from training in the hospitals themselves, have acquired the ability to deal with questions of structure, repair, lighting, heating, ventilation, equipment, food-supply, and the details having to do with a housekeeping for hundreds of patients and nearly hal that number, the usual ratio, of medica house-officers, nurses, and attendants.

Many hospitals are administered by women who have had their preliminary training in such institutions as nurses; women are also supplementing the general

administrative work as superintendents of hospital training-schools for nurses.

The entrance of women into hospital life and work is one of the sociological advances for which the medical profession is mainly responsible, a responsibility having a serious ethical as well as an important economic side.

Under present conditions the training-schools furnish to the hospitals a much better service than could otherwise be obtained, one which has contributed much to the precision and fidelity of the work done and which has moreover exercised a generally beneficial effect upon the morale of the patients.

The course of study of the hospital-trained nurse is a severe one, usually of two years' duration, but now being lengthened to three and four years; the woman who enters upon, and continues in it, has a liberal education in the deterrent side of human life and, if she graduates well, comes out of the hospital to enter individually upon a vocation in which she is likely to find herself set apart from the society about her, even more than is the physician.

For, while the physician has his medical societies and other social relationships with his fellows, the nurse has only the affiliation with her training-school and hospital; that she often finds it difficult to cope with the competition in her profession and the discomfort of an uncertain income, is shown by the tendency to re-enter institution-life, even at moderate salaries, among nurses who have been in private practice.

The trained nurse has now been in existence, as a community factor, a sufficient length of time to make statistical estimates possible, and it appears that the active professional life of the nurse, outside of institutions, is covered by an extreme limit of fifteen years, and that her average annual income is that of the average woman teacher.

The teacher has a regular stipend, allotted hours of work, and a definite holiday; the nurse, in private practice, has no regular stipend, no protracted leisure, and leads an economically irregular life, with occasionally extraordinary demands upon her strength and powers of endurance.

The medical profession, which has created the trained nurse, to its own great advantage and with considerable extension of its helpfulness, owes a debt which should be acknowledged not only individually but generally.

The provision for lodgment of nurses in separate buildings where they may, when off duty, have the comforts of a home, is a step in this direction; here also the training in the hospital is supplemented by instruction in housekeeping, purchasing, and diet-kitchen work, and the nurse thus educated who goes into private practice and becomes temporarily the member of a household, does so with a better knowledge of the perplexities which may beset the housemother when illness cuts across the line of home affairs.

Another question which is coming to the front is that of the establishment of co-operative training schools, in which a nurse, having served her probationary period and a year or more in one hospital, is passed on to a second and third hospital, either of a different class or in another city, returning to the first hospital for her final service and graduation. Under this plan the nurse, admitted only on an entrance examination and first trained in a general hospital would continue her studies in a lying-in hospital, a children's hospital, some special hospital, and in a hospital for contagious diseases, and the higher educational standard required of applicants, the length of the course and its completeness, would tend not only to furnish a better class of women, more competent to succeed in private practice, but would help to prevent that over-

crowding of the nursing profession already apparent.

Leaving now the hospital, a term here meant to include asylums, convalescent homes and similar institutions which are his particular province, and passing over questions, interesting in themselves in regard to the working relationship of medical staffs and boards of managers, let us consider other directions wherein the physician finds opportunities for the acknowledgment of his citizenship.

The medical supervision of public schools, of recent inauguration, demanded as a necessity in view of the opportunity afforded for the spread of contagious diseases through the medium of these aggregation centers, is opening the way to a much larger sociological service than was at first expected of it; for, where medical inspection has been fairly established, the examiners find themselves confronted with questions of the proper seating of school children, of the provision of school lunches, of proper lighting, ventilation and sanitary accommodations and of the detection and setting aside for compensatory educational advantages children whose defective sight or hearing puts them below the average of their fellows.

It is in schools for the defective, however, that the doctor finds his especial work, and the generous provision now made for the care of feeble-minded and backward children, the blind, the deaf, and latterly the crippled, gives him a large opportunity for elucidative study leading toward the betterment of the condition of those whose inheritance or personal misfortune have made them a charge upon the community, not only for assistance, but for encouragement toward turning their moderate capital in life to the best account.

The distinction between lack of perceptive capacity and lack of sense-transmission is frequently represented only by a thin and shadowy line, and the partition classification of dependent and imperfect children is often one of the most exacting of the moral responsibilities of the doctor.

Children who are regarded as backward, or even idiotic, are sometimes found on careful examination, to be merely creatures shut within themselves by the closure of normal channels of communication, and the bringing of such children into touch, through the education of their tactile sense, with the human companionship which makes life worth living is worth far more than all it costs in time or effort.

In such cases as these the child has virtually no desultory memory, all impressions received come mainly through one channel and the memorizing capacity is in proportion to the concentration effort in reception, the nervous energy of the child, moreover, instead of being expended in an effort at reception through several sense organs, is limited to a distinctively volitional one, and in place of being used in the elaboration of different methods of expression, is devoted almost solely to perception.

The intelligence, slowly educated by an expenditure of effort on the part of the child, is, reactively, constantly increasing the perceptive power, so that when, through the utilization of a quickened tactile sense, new forms of expression are afforded, the concentrated nervous energy bursts its bounds in a flood of questions and there is no fairyland imaginable which will compare in its wonders to that into which such a child is admitted through the educational portals of the kindergarten for the blind.

The first attempts at the education of the so-called deaf mutes, but mutes only because of the lack of hearing and of training, began naturally through the medium of the signs and gestures which these unfortunates substituted for the inadequate utterance of which some of them were capable. While succeeding in imparting a good education

through the medium of the manual and gesture language, this method created a class set apart by itself because of its inability to communicate, through any other medium than that of writing, with its hearing and speaking environment.

The recognition in an educational process, of so serious a defect as the creation of a distinct class in the community, subject to the temptation of intermarriage and the consequent possibility of class perpetuation, together with a better knowledge of the fact that many of these people had an amount of hearing power sufficient to enable them to perceive sounds which they themselves made, brought about the gradual introduction into the manual schools, of a system of voice-training and lip-reading, which has so far gained ground as to lead to the establishment of schools devoted exclusively to this method.

The growth and progress of schools for the deaf in the United States since the establishment of the first school in 1817, may be judged from the fact that the twelve original pupils at that date have now increased to almost ten thousand, in over eighty schools, and that very nearly half this number of pupils are being taught articulation.

With the progress of a method of education which is ultimately destined in the main to prevail, since it is in the line of that sociological advance which seeks to make and to keep each unit a viable member of the community, a more precise determination of the amount of hearing possessed by each pupil, and the possibility of its improvement becomes a matter of great importance.

Under the auspices of the National Association of Teachers of Speech to the Deaf, acting in co-operation with one of the bodies forming this Association, the American Otological Society, a systematic examination of all pupils in schools for the deaf throughout the United States has been undertaken.

The purpose of this investigation is to provide not for what might be called a census-taking, but for the establishment of continuous special medical examination of the pupils, firstly, for their immediate advantage, and, secondly, to make records upon a uniform basis suitable for comparison and tabulation.

The work, already begun as a preliminary investigation in the Horace Mann School, shows that out of 150 children, set apart by their infirmity and specially educated, fully 8% are capable of being restored to an amount of hearing which will enable them, in some instances with the help of artificial aids to hearing, to take their places in the society of people of normal average hearing, while still others, to the extent of an additional 5%, can be so far improved as to be materially aided in their power to acquire well-modulated articulation.

Between 10% and 15% of these cases, in addition to those already mentioned, are found to illustrate the truth of the saying that disuse is abuse, for in them it is possible, by means of speaking-tubes and other appliances for the direct communication of sound to the perceptive organs, to awaken what may be called, for want of a better term, the latent hearing, and make it, if not a means of communication of consecutive thought, at least useful for improvement of the articulation.

With the continued prosecution of this investigation there is opened a large field for the study of the causes of high grades of deafness in young children, and one leading to better knowledge of possibilities of prevention.

A more recent effort at compensatory education follows lines laid down nearly 70 years ago in Bavaria, and since extended to other countries in Europe, finding its most marked success in Italy.

Five years ago there was opened in Boston a charitable institution which deserves more than passing notice for the comparative novelty, as well as the value, of the work undertaken, and for the promise which it gives of extension.

The Industrial School for Crippled and Deformed Children, beginning with 11 pupils in 1895, now with quadruple that number and a large waiting list, has served as a suggestion for the establishment of other institutions of the same or similar character in Milwaukee, Chicago, and Baltimore.

In New York a school of this kind is now projected, and in Philadelphia Mr. Widener has recently given the sum of two million dollars, the income of which is to be expended for the care, education, and industrial training of cripples.

"Strange it is," says Dr. E. H. Bradford, the practical founder of the Boston school, in a paper not yet published, but from which I am permitted to quote, "that while in every civilized country the insane, the blind, the dumb, the epileptic and the idiotic receive careful attention, but little heed is paid to the education of the most deserving of all unfortunates, namely the crippled.

"The cripple is left to the almshouse or allowed to remain in a back room at home idle, useless, petted, often the only wilful member of the family whose misdirected kindness aids in ruining his character; hampered by disease and deformed, he is doomed to the injurious influence of idleness.

"Crippled children can be grouped under two heads: those who are suffering from a chronic disease which, during their childhood, either prevents their attending school altogether, or else where their attendance is interrupted or prevented because their feeble condition will not stand the fatigue of a school day adapted only for strong children. The majority of these, if they receive good care, good food, good air, under proper medical supervision, recover with more or less resultant deformity and, although handicapped as breadwinners, are eventually able to do something as workers, that is, if trained during their childhood, may become skilled in sedentary occupations, but if uneducated, are necessarily idle and useless.

"The second class comprise those permanently crippled either by congenital deformity or by paralysis. They can never recover from their ailment and are permanently excluded from the use of their legs or arms. Special instruction is needed for these and special avenues must be made for them for certain kinds of work which they can be taught to do with the aid of suitable apparatus designed for them. This class can be of use to the community in many instances, as their affliction frequently develops a concentrated ability in certain directions, not found in more active or healthier persons. If they are unable to become producers to a large extent, yet in many instances they may be trained into workers contributing to their support. They are saved from the curse of idleness and in rare instances may develop unusual and useful talent."

To make provision for these two classes in a day school it is necessary, or at least advisable, to furnish means of transportation under conditions favorable to the most helpless, and in the school itself, there must be, in addition to the ordinary recitation and study rooms, rest rooms with reclining chairs or beds, rooms for the training of the pupils in various occupations, and a diet kitchen from which food may be dispensed.

To meet these peculiar conditions the staff of teachers must be supplemented by a trained nurse, and there should be regular medical visitors, preferably men on service in orthopedic hospitals.

The census of 1890 gives the number of feeble-minded, both children and adults, in

the United States as a little less than one hundred thousand; but one of the best authorities in the treatment of this class of dependents thinks that there are probably four to every thousand of the population, or a total of very nearly three hundred thousand. Of this number about one in thirty only are in institutions and the remainder are scattered throughout the community, some in their own homes, where they are the objects of solicitous care and affectionate regard, others and the larger proportion, in almshouses, in prisons, and on the road as tramps.

Their number is apparently increasing. In 1860 there were six hundred to the million inhabitants, in 1890, fifteen hundred to the million; and they propagate their kind; with them are linked the variable and occasional criminals, as distinguished from the criminals having criminal trades, and about the borders of this realm of the unfit circulate the merely idle, the dissolute, the profligate and the debauchee.

The differentiation of these classes, the sorting out of this waste humanity, the utilization of what is good in it and the protection of that which is feeble and useless constitutes one of the most intricate problems of modern social life.

He who holds the key to a situation, is in a measure responsible for the situation and the key to this particular problem is in the hands of the doctor more than in those of any other citizen.

He, more than any other, as a necessity of his education, has been brought personally into contact with the deficient, his active life is spent in drawing comparisons with a normal standard of which, if he is to do his work well, he must constantly seek to keep himself, physically, mentally, and morally, an example.

It is evident that among the many lines of sociological activity prescient of the growing intelligence and increasing public conscience of the people, this work of analysis of human waste and of discrimination out of which grows helpful suggestion is particularly the province of the doctor.

A measure of work of this sort should be commanded of the medical profession by the community, not that the medical profession is not already engaged in such work and does not find in it fruitful opportunities, but that to command is to sustain and to support, and the public could with advantage make the labors of the physician for the common welfare more productive than they are at present.

The experience which has led to the substitution, in the hospital supported by private charity and in the municipal hospital, of an educated and trained physician for the man of business or the politician as superintendent, should serve the same purpose in our public institutions. The doctor is ready and willing, and the number of medical men who would accept positions of this kind at moderate salaries under conditions which would give them time and opportunity for studious work, is steadily increasing.

The popular idea of an almshouse is often very much that it is a place for the storage of decrepit bodies past usefulness, an institution paying an annuity in food and lodgment to such members of the community as have not had the fortune or the foresight to provide for their inactive years.

It is partly to the prevalence of this idea that institutions of this class have been public jetsam stranded on the shores of the current of community life; but, the stream of humanitarian progress increasing in volume and growing ever stronger, is lifting them, they are coming to be regarded more as hospitals, administered more upon the hospital plan, and in several of the largest city almshouses of this country the changes which have taken place, to the betterment of the inmates, under the influence of a reg-

ular medical visiting staff, supplemented by salaried house-officers and trained nurses, is most gratifying and promissory of still better conditions.

The same influence is at work in the domain of penology; prisons everywhere are steadily coming to be less punitive, more reformatory, and the in determinate sentence is a recognition, not only of the possible good underlying apparent evil, but also of the fact that betterment of the physical condition, as well as of the mental point of view, is a necessary basis for a healthy morality.

Dr. Coulston, of the Royal Edinburgh Asylum, illustrates the fact that purely mental and moral causes play but a small part in the production of insanity, as compared with causes bodily and physical, by the statement that of cases examined by him only 11.5 per cent. were due to mental shock, the remainder being the outcome of causes acting on the brain through the body; drink and dissolute living, faulty development, hereditary disposition and the like; furthermore, he gives it as his opinion that the late epidemic of influenza caused more insanity than all the public and private anxiety in connection with the war in Africa.

The weakness of will and the inability to sustain healthy mental exertion, evident in asylums for the insane, are found also, though in lesser degree, in houses of refuge, almshouses and prisons, and the parallelism of conditions of the mentally, morally and physically defective, with the interchangeability of their classification, are nowhere more compactly observable, more readily made subject of study, than in the public institutions departments of our great cities with their shifting population passing from one institution to another, a pauper, a drunkard, a malefactor in succession, but always a public charge.

These departments, classed in the civic roster with the departments of public works as channels of expenditure, fiscal administration and possible political preferment, have come to be regarded, because of their humanitarian function, as fields for the exploitation of philanthropic effort.

Worthy and commendable as this is and most welcome as opening the way to still better defined conditions, it fails of its fullest efficiency because it lacks the necessary foundation of accurate information in regard to the subjects with which it has to deal and, under the ordinarily existing political conditions, fails of continuity of effort.

The care of the physically, mentally, and morally sick is so very serious a part of the business of life, its judicious exercise so important to the welfare of the whole community, that it is best placed, unreservedly, in the hands of those whose training has fitted them for its obligations and who have learned, by repeated experiences, that an emotion however good, or an impulse however philanthropic, unexpressed in carefully considered and continuously beneficial work, sinks to the level of a personal gratification.

The ideal institutions department is that which, removed entirely from political control, but still a part of the city government, is adjusted and administered upon the hospital basis, bringing to its service, as does the hospital, the conjoint efforts of the man of business and the physician. The actual work is in the hands of a general superintendent or commissioner, a medical man of large experience and institution-training at a salary enabling him to devote his whole time to the duties of his office; under him, as the heads of subdepartments, salaried officials, among them medical men and women and house officers, either senior medical students or recent graduates, holding positions the equivalents of those in general hospitals.

The whole under control, both as to appointment, general management and ex-

penditure, of a board of trustees, the majority physicians, and an unpaid visiting medical staff.

The existence of such an institutions department would mean the establishment of a biological station, which would be the means of bringing the greatest benefit to its inmates and at the same time would be an educational center from which would emanate, for professional and public information, deductions derived from conscientiously applied scientific observation.

Affiliated with the Institutions Department in cities is the Department of Police; through the police station pass a large proportion of the inmates of the city institutions and, under police supervision and inspection, live the defectives with whom the medical profession could, advantageously, be brought into more recognizedly effective contact, either by medical appointments on police commissions or by the creation of medical bureaus as a part of police departments.

Such bureaus, in addition to rendering the professional services for which private practitioners or contract surgeons are usually employed, would provide responsible care and carefully trained investigation in cases of accident or violence with correspondingly accurate records, and could be made to do valuable correlative work with the institutions, the police and the hospitals.

It has been said by the trainers of youth that they do not get from the doctor the help expected and needed in the inculcation of those lessons which teach the moral value and moral use of the human body and are the substructure of healthful living, but it is doubtful also if the doctor has as yet had his sufficient opportunity.

The recent endowment in a large university, of a professorship of hygiene, with the stipulated condition that the appointment shall bear with it the obligation of a closer relationship with the lives of the students, is an important and welcome step in this direction, and the chair so endowed might be made the center of a Department of Civics.

Still another relationship, which may be broadened beyond its individual phase, is that between the doctor and the clergyman, and recent experiments based upon a proposition that the divinity student should have opportunities to see the practical side of hospital and other institution work under medical guidance, are so promising as to lead to the serious consideration of making this a definite part of regular divinity-school instruction, while the growing appreciation of the importance of medical missions, with the understanding that they are to be in the charge of thoroughly educated physicians, and the demands for instruction in medical ethics in our medical schools show a tendency to approximation in the work of two professions which began originally as one.

It would be interesting to take up in detail other and various channels through, which the doctor, because of the elaboration of modern community life, finds recognized opportunities for his outgo from the unit to the mass; such, for instance, as questions of water-supply and sewage disposition, food and drug adulterations, asylum and hospital construction, health and quarantine regulations, hygiene and physical training and to cite illustrative instances; but enough has been said to emphasize the fact that his principal value to the community springs from his intimate knowledge of the personal needs of his brother man.

His sociologic status is the outcome of this distinctive privilege, and his recognition and proper use of it, as the teacher of the individual and as the exponent of the beauty and righteousness of cleanly, wholesome and useful living, make his foremost duty to society.

Clarence John Blake.

Harvard Medical School.

ALUMINIUM-MAGNESIUM ALLOYS.

THERE have recently appeared accounts of a 'newly discovered' series of alloys of aluminium and magnesium which are considered by their discoverers peculiarly valuable and promising. Dr. Mach, for example, has named such alloys 'magnalium.' Possibly other investigators may not be aware that this series was long ago investigated at the suggestion of the writer and in considerable detail in the laboratories of Sibley College. The writer published an account of the work in 1893 and it has been reproduced or summarized in several cases since.* The following are the tabulated results of such tests of strength of the two metals and their alloys as then determined. The succeeding graphic illustration of their variation of quality and the law of such variation is from a paper read by Professor Carpenter, in 1898, before the American Society of Mechanical Engineers and published in their transactions for that year.

TENACITY OF MAGNESIUM.

Number of Test Piece.	Diameter.	Breaking Load Lbs.	Breaking Load Lbs per sq. in.	Elastic Limit Lbs. per sq. in.	Extension per cent.	Modulus of Electricity.
1.....	.433	3,500	23,800	8,800	4 2	2,040.000
2.....	.433	3,250	22,050	.....	.....	1,860,000
3	.442	3,200	20,900	10,780	1.8	2,060,000
4.....	.435	2,900	19,500	8,400	2.5	1,830,000
5.....	.424	3,500	24,800	7,090	3.1	1,930,000
6.....	.432	3,300	22,500	.....	2.3	.....

ALLOYS OF ALUMINIUM AND MAGNESIUM.

Number of Test Piece.	Percentage of Magnesium.	Specific Gravity.	Breaking Strength. lbs. per sq in.	Elastic Limit. lbs. per sq. in.	Modulus of Elasticity.
1	0	2.67	13,685	4,900	1,690,000
2	2	2.62	15,440	8,700	2,650,000
3	5	2.59	17,850	13,090	2,917,000
4	10	2.55	19,680	14,600	2,650,000
5	30	2.29	5,000	.....	.....

From this table it will be seen that, for magnesium, the

Average breaking strength is	22,250 lbs. per sq. in.
Average elastic limit is.....	8,870
Average elongation is.....	2.8 per cent.
Average modulus of elasticity is.....	1,945,000

It is noticeable that though the density of the metal is only two-thirds that of aluminium it has one-half more tensile strength; the latter averaging, pure, about 15,000 pounds.

The addition of magnesium to aluminium reduced ductility steadily with rising proportions and, at one-third magnesium and two-thirds aluminium, the alloy was as brittle as glass. Magnesium refused to alloy with iron. The alloys with aluminium, where the proportion of magnesium is small, give promise of finding useful and valuable applications in the arts.

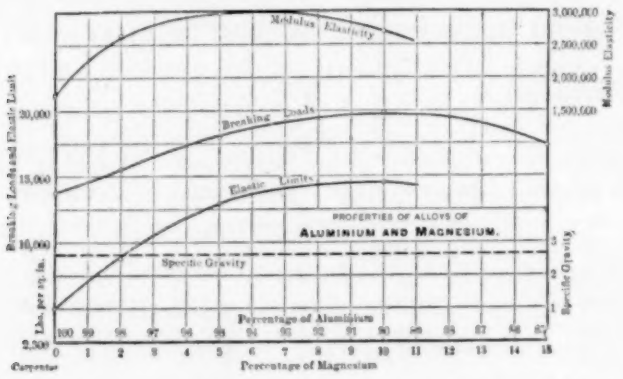
The series of tests of which the diagram

* For earlier work on properties of magnesium and its alloys, see 'Materials of Aëronautic Engineering,' *Transactions Aëronautic Congress*, Chicago, 1893; also *Sibley Journal*, April, 1894.—R. H. T.

'Magnesium as a Constructive Material.'—R. H. T. *London Machinery*, May, 1896; 'Industries and Iron,' May 22, 1896. Also Thurston's 'Materials of Engineering,' vol. iii., pp. 94-561.

'Mechanical Properties of certain Aluminium Alloys,' R. C. Carpenter; Trans. A. S. M. E., vol. xix., 1898, No. DCCLXXXIV.

is the record in graphical form were made in 1893 by Messrs. Marks and Barraclough in the course of regular graduate work in



the mechanical laboratories of Sibley College.* The writer had always anticipated useful employment of such alloys, since the properties of magnesium became familiar to him, in the experimental use of the metal for signal purposes in army and navy, 'in the sixties,' with the assistance of Admiral Luce and of General Myer, then Chief Signal Officer of the Army of the United States.

The volatility and combustibility of the lighter metal are elements of difficulty in its use in alloys, especially with those, as copper, which have a high temperature of fusion; but a little care and sometimes very simple special precautions will be found to readily evade such obstructions to its use.† The metal, weighing about two-thirds as much as aluminium and between one-fourth and one-fifth as much as iron or steel, has a more than proportional strength, and pieces of the metals having similar size will carry more nearly equal loads. The first at all complete studies of the constructive value of this metal and its alloys were made, on the initiative of the writer, as above, in the laboratories of Sibley College; to which laboratories he had turned over his collected material for that purpose, mainly, at the time, with a view to securing some definite knowledge of its value for the purposes of 'aëronautic engineering,' and with the intention, actually carried into effect, of reporting the outcome to the International Engineering Congress at Chicago in 1893. The result was to show that aluminium might be considerably strengthened by alloying with magnesium in small quantities as above; but that the alloying metal was itself stronger than the alloys, and that the presence of aluminium reduced the strength of magnesium.

The best comparison of these metals and their alloys is that by comparing the lengths of bars of the metal, suspended from one end, that can be carried without breaking. The extreme range of the tenacities of magnesium was between 20,000 and 30,000 pounds per square inch, corresponding to a

* Mr. Marks is now Assistant Professor of Mechanical Engineering at Harvard University and Mr. Barracough has charge of the Department of Electrical Engineering at the University of Sidney, N. S. W., of which institution he is an alumnus. Mr. Marks is a graduate of the University of London and of Mason College, Birmingham, England.

† The writer employed magnesium for illuminating and for signal purposes about the close of the civil war (1864-65), and, while stationed at the U. S. Naval Academy (1865–71) experimented with a variety of signal apparatus devised by himself for long-distance work, as above. The most successful forms of apparatus for this application of the metal were constructed for the use of magnesium in powder, in which a suitable proportion of sand was used to insure free flow as well as economy. The most successful form for other illumination, as photography, stationary signal lamps, theater tableau work, etc., was the ribbon lamp, of which latter a large number were in use when the electric light entered the field and threw them out. See 'A New Marine Signal Light,' describing this apparatus (patented in May, 1866), *Journal Franklin Institute*, 1867, R. H. Thurston, in which paper the writer gives the costs of signalling: sixty cents by the magnesium apparatus employed by him, and six dollars for the same message sent by the then usual Coston signals. The marine apparatus was taken by Admiral Luce on his cruise to the Mediterranean in the summer of 1866, and the army signal was employed by General Myer about Washington. The latter is now in the possession of the writer. It was built from the designs of the writer by the American Magnesium Co. of Boston.

suspension of 30,000 to 40,000 feet. This is the equivalent of steel of about 100,000 pounds tenacity. Could the cast portions of the steam-engine be made in this material for our torpedo-boats or aëronautic and automobile machinery their weights would be reduced about one-half. It remains to be seen whether, the costs permitting, this change would be to any extent practicable. Dynamos have been constructed, in the shops of Sibley College, of aluminium and a gain thus secured for portable and automobile work of some importance, and it is possible that magnesium, with its higher tenacity and greater lightness, may prove the coming material for some such work. Costs will undoubtedly fall rapidly with increasing area of market.

R. H. THURSTON.

SCIENTIFIC BOOKS.

La constitution du monde. By MADAME CLÉMENCE ROYER. Published by Schleicher Frères, 15 Rue des Saints-Pères, Paris. Containing 799 pages, 100 chapters, 92 figures, and 4 plates.

This pretentious volume is claimed by its author to contain a new and satisfactory philosophy of nature including everything from the geometrical structure of molecules to a theory of the evolution of worlds. In a somewhat remarkable preface the author expresses in forcible terms her contempt for those philosophers who maintain that certain things are unknowable, and asserts that their speculations were advanced to enslave the minds of men and support the dogmas of theologians. The following quotations of remarks concerning scientific subjects will indicate her attitude of mind: "The kinetic theory of gases is certainly a romance conceived by the imagination of a German mathematician." The non-euclidian geometries "founded on sophistic generalizations of analysis * * * have for their result and their end, the clouding of the intellect in undermining the foundations of rational certitude, to the profit of those who are attempting to reduce mankind * * * to the *credo quia absurdum* of blind and unquestioning faith."

The ideas advanced upon scientific questions are not worth the space that it would require to enumerate them, much less to make any critical comments. They indicate, as is in reality confessed in the preface, that the author has read, though widely, with a mind strongly biased by preconceived notions, and they show at every point a lamentable lack of scientific training and spirit. The contents of the 99th chapter are sufficient to illustrate the statement. The author in her 'evolution du monde' supposes that at some remote time a planet from exterior space struck Saturn a glancing blow greatly accelerating its rotation; that the Saturnian oceans and portions of the solid crust were hurled off and formed the rings, which are ice, or perhaps aluminium; that the striking planet was broken up forming the satellites of Saturn, Jupiter, Uranus, Neptune, Mars, and the Moon, the asteroids, the meteor streams; that Venus and Mercury have no satellites because they were on the opposite side of the sun when the collision occurred; that the Moon and the satellites of Mars move with less linear velocity than those of the larger planets because they are so far from Saturn that the velocities of the flying fragments had largely died out before they reached their respective primaries; and that the second satellite of Mars 'by a remarkable exception does not fulfill the laws of Kepler.' The figure inserted in the chapter makes the theory very clear.

It is to be regretted, for the sake of the author who devoted so much time to writing the book, and for the sake of Madame Valentine Barrier who bore the expense of its publication, that it is impossible to say that the work is worth reading. F. R. M.

The Chemistry of Soils and Fertilizers. By HARRY SNYDER, B.S., Professor of Agricultural Chemistry, University of Minnesota, and Chemist of the Minnesota Agricultural Experimental Station, Easton, Pa. The Chemical Publishing Company. 1899. 12mo. ix + 277 pp. Price, $1.50.

This book is the outgrowth of courses of instruction given at the University of Minnesota

"to classes of young men who intend to become farmers, and who desire information that will be of assistance to them in their profession." It aims to give "the principles of chemistry which have a bearing upon the conservation of soil fertility and the economic use of manures." The author has performed his task in a very satisfactory manner. He has treated the subject logically and systematically, giving first the scientific principles, and then laying stress on their practical application, but not to such a degree as to make the work a hand-book instead of a text-book. The historical development of the subject has not been neglected, though naturally the treatment has been very condensed.

Notwithstanding the general excellence of the work, there are certain errors and defects which cannot be overlooked. The language is, at times, too condensed for clearness, as, for example, in the description of the analysis of soils on page 74. The writer has a habit of leaving out the comma in sentences like these, 'that produced from cellulose bodies as sawdust,' 'produced by each material as green clover, oat straw.' It is stated on page 42 that "the additional amount of water in the humus soil may cause the soil temperature to be lower than that of the sandy soil. While the humus soil absorbs more heat than the sandy soil, the heat is used up in evaporating water." The heat is used up in warming the water, more than in evaporating it; the specific heat of soils being from 0.2 to 0.4, as stated in the next paragraph. On page 93 the statement is made that, "the non-nitrogenous compounds as cellulose, starch and sugar undergo a fermentation but seem to possess little, if any, power to form humates in the soil." And the third sentence reads, "straw, sawdust and sugar, materials rich in cellulose and other carbohydrates, yield a humus characteristically rich in carbon and poor in nitrogen." These statements appear inconsistent. The table on page 94 is not correctly arranged. On page 115 the statement is made, "like the nitrates and nitrites, the ammonium compounds are all soluble and hence cannot accumulate in soils which receive an average amount of rainfall." This leaves a false impression, for ammonium compounds are fixed by soils almost as readily as potash, becoming soluble with difficulty (1 part in 10,000 of water), while the nitrate and nitrites are not fixed, but wash out with great readiness. The fact that ammonium salts are fixed by the soils is not mentioned in the chapter on fixation.

This book is, on the whole a very good one; it is cordially recommended to the attention of all instructors in agricultural chemistry, and, while not written with this end in view, it is recommended to those agricultural chemists who desire to obtain a survey of the rapidly widening field of research relating to soils and fertilizers.

G. S. Fraps.

A Short History of the Progress of Scientific Chemistry in our own Times. By William A. Tilden, D.Sc., F.R.S. Longmans, Green & Co., London, New York, and Bombay. Pp. x + 276.

The task which Dr. Tilden set before himself in the preparation of this book was to give in broad outline a sketch of the development of chemistry during the period of the Victorian era. The subject has been treated topically rather than chronologically, and the method of treatment chosen is abundantly justified in the result. The topics selected are: Matter and Energy; The Chemical Elements; Atomic Weights; Classification of the Elements; Valency and the linking of Atoms; Synthetical Chemistry; Stereo-chemistry; Electricity and Chemical Affinity; Liquefaction of Gases. An exhaustive historical treatment of these topics does not, of course, lie within the scope of the work. Indeed, its value depends very greatly on the fact that the author has known so well what to select, and because the topics selected have been treated with sufficient fullness to be interesting and intelligible to any one possessing an elementary knowledge of the subject. The book should find a large field of usefulness.

W. A. Noyes.

Outlines of Industrial Chemistry. By Frank Hall Thorp, Ph.D., Instructor in Industrial Chemistry in the Massachusetts Institute of Technology. A text-book for students. New Edition revised. New York, The Macmillan Company. 1899. Pp. xvii + 541. Price, $3.50.

The excellence of Dr. Thorp's book is evidenced by the appearance of a second edition within one year after the printing of the first. The first edition was reviewed in SCIENCE, Vol. 9, p. 150. Very few changes, further than the correction of a few errors which have been brought to the author's notice, have been made. The book well deserves the success it has achieved.

W. A. NOYES.

GENERAL.

IT is proposed to publish, under the editorship of Mr. W. L. Sclater, director of the South African Museum, a series of volumes dealing with the fauna of Africa south of the Zambesi. The northern limits of South Africa, as treated in this work, will be a line drawn from the Cunéné River on the west to the Zambesi at the Victoria Falls, and thence along that river to its mouth. Within it will, therefore, be enclosed the British colonies of the Cape and Natal, the two republics of the Transvaal and the Orange Free State, the southern half of the Chartered Company's territory, German Southwest Africa, and that portion of Portuguese East Africa which lies south of the Zambesi. The first volume, by Arthur C. Stark, M.B., containing Part I. of the birds, will shortly appear, and it is hoped that that relating to the mammals, by Mr. Sclater, will be ready for publication during the course of the present year. The work is published by R. H. Porter, 7 Princes St., London.

IN *The Indians of Southern Mexico* Frederick Starr, of the University of Chicago, presents some of the results of his several expeditions to Mexico. The chief objects of these expeditions was the study of the physical types of South Mexican Indians. Three methods of work have been followed—measurement, photography and bust making. The tribes studied live among the mountains, and some of them—as the Triquis, Chontals and Juaves—are almost unknown to students. In the photographic work Professor Starr has secured portraits, groups, scenes in daily life, views of houses and towns and of scenery. For portraits plates 5x7 inches were used and front and profile views made of each subject; for full figures and occupations 5x8 inch plates were used; for large groups, architectural subjects, villages and landscapes 8x10 inch plates were employed. Hundreds of negatives have been made representing the tribes of the States of Michoacan, Mexico, Flaxcala, Puebla and Oaxaca. From this series a selection has been made for publication. The book contains one hundred and forty-one beautiful photogravure plates, 11x14 inches in size, printed on heavy plate paper and well bound. They are accompanied by thirty-two pages of descriptive text. On account of its great cost the work is a limited edition, but it will have permanent value.

SCIENTIFIC JOURNALS AND ARTICLES.

THE *Journal of Geology*, Vol. 8, No. 2, February–March, 1900. Besides the reviews and notes on recent publications, this interesting number contains: 'The Nomenclature of the Feldspathic Granulites' by H. W. Turner. The author advocates the naming of the rocks in accordance with their mineral molecular composition and in the case of the feldspathic granulites, to abandon the term plagioclase, which expresses a mixture of two or more kinds of molecules, and substitute the more descriptive terms for the rocks which contain the larger per cent. of the single molecules such as orthosite, anorthosite, albitite, oligosite, andesinite, labradite, and anorthitite. When quartz is abundant then the terms should be compounded as quartz-orthosite. If an accessory mineral term is introduced into the name it should take the adjective form as quartziferous syenite. 'The Geology of the White Sands of New Mexico'; with three plates, by C. L. Herrick. The geological features of the regions east of the San Andreas and Orange Mountains of New Mexico and those bordering the great white sand plains are discussed, and the opinion is expressed that the white sands are derived from the weathering of the ridges of gypsum and are entirely dune sands, that the alkaline and saline deposits of the region are derived from the red beds (Permian and Triassic) and the associated saline and gypsiferous members. The copper deposits are thought to have a similar origin also. The suggestion is offered

that the low depressed areas and local basins are caused by the leaching out of the soluble materials from the underlying beds. 'The Origin of Nitrates in Cavern Earths,' by William H. Hess. The author finds from a study of cavern earths and from many analyses that the nitrates are derived from the soil layers above the caverns and are carried into the caverns by the percolating waters and are finally left in the cavern earths by the evaporation of the water. 'The Calcareous Concretions of Kettle Point, Lambton County, Ontario,' by Reginald A. Daly. The article is illustrated with six reproductions of photographs of these noted concretions and after a somewhat extended discussion of the subject of concretionary growths, the author concludes that these particular concretions "were formed in place in the shales and antedate the period of joint development and final consolidation of the surrounding rock, that the local deformation of the shale accompanied the crystallization, that the energy of the deformation was derived from the change of volume induced by the breaking up of the bicarbonate into the monocarbonate and the fluid biproducts." 'Ants as Geological Agents in the Tropics,' by John C. Branner. The author concludes that the geological work of ants in the tropics is much more important than that of the earthworms in the temperate regions and he records a number of observations on the point. 'Variations of Glaciers,' by Harry Fielding Reid. A summary of the fourth annual report of the International Committee on Glaciers is given. Under the section of Studies for Students, Dr. E. R. Buckley gives a very comprehensive discussion of 'The Properties of Building Stones and Methods of determining their Value.' The author treats especially the economic phase of the subject.

W. G. T.

SOCIETIES AND ACADEMIES.

ZOOLOGICAL CLUB, UNIVERSITY OF CHICAGO.

MEETINGS OF FEBRUARY AND MARCH, 1900.

At the meeting of February 14th, Mr. W. J. Moenkhaus presented a paper entitled 'Some Stages in Hybrid Development' giving some of the results of his experiments upon the production of hybrids among fishes, and Miss Mary Hefferan reviewed Rand's papers on regeneration and regulation in Hydra. The following is an abstract of Mr. Moenkhaus' paper:

Of some twenty crosses made between some of our commoner marine and fresh water fishes there was not a single failure of impregnation, though many of the crosses were between very distantly related forms—soft-rayed and spiny-rayed species. The per cent. of eggs impregnated was, as a rule, quite large, but this bore no relation to the nearness of relationship. Two combinations gave beautiful instances of what a study of the nuclear conditions has shown to be dispermy, fifty per cent. of the impregnated eggs falling directly into four cells, the remainder into two. In all crosses segmentation was carried through. Four crosses went to completion of gastrulation, forming the neural tube, but no optic vesicles. The remainder hatched. From crosses among the trout it appeared that the formation of the tail is a difficult process. Considering in this connection the common phenomenon of infertility, it seemed that in hybrid fishes there were at least four pretty definite stages in development that are critical: (1) beginning and (2) close of gastrulation; (3) formation of tail bud, (4) formation of the sexual elements.

The nuclear behavior during fertilization and during degeneration in these partially successful crosses is being studied.

The session of February 28th was devoted to two papers; a review and critique by Mr. E. R. Downing of Delage's recent work on the fertilization and development of enucleated egg-fragments, and a review by Miss Anne Moore of Calkin's paper on 'Mitosis in Noctiluca.' A few of the more important points touched upon by Mr. Downing were as follows:

Delage finds in embryos produced by the fertilization of enucleated egg-fragments the normal number of chromosomes. He claims to demonstrate (1) a maturation of the cytoplasm corresponding to, but independent of, that of the nucleus; (2) that enucleated eggs resist hybridization as well as entire eggs and that, therefore, the nucleus has nothing to do with such resistance; (3) that the female nucleus is inert and the male excitable. The latter con-

clusion is drawn from the fact that the whole eggs did not fertilize in a drop of water as well as the enucleated fragments. His conclusions were criticised, for the whole eggs in abundant water all fertilized as usual. The only justifiable conclusion would be that confinement in a drop of water prevents fertilization of normal eggs, while it is not an unfavorable condition for enucleated fragments. The small available supply of oxygen may account for this. The second conclusion above given is drawn from contradictory results. The proper inference to draw is that the possibility of entrance of the sperm is determined in hybridization by other things than the presence or absence of the nucleus.

At the session of March 14th, a paper entitled 'The Derivation of Annelid Nephridia' was read by Mr. R. S. Lillie, consisting of a resumé and discussion of the various theories regarding the morphological significance of annelid nephridia.

C. M. CHILD.

THE PHILOSOPHICAL SOCIETY OF WASHINGTON.

AT the 517th meeting of the Society, held April 14th at the Cosmos Club, Professor Geo. L. Raymond, of Princeton University read a paper on 'Some Æsthetic Aspects of Music.' He showed that the one distinction between talking and singing lay in the sustained character of the tones of the latter. Birds, dogs or men chirp, bark or talk in unsustained tones at those who have interrupted them. They sing, howl or hum in sustained tones, subjectively and spontaneously. This explains why music need not convey definite intelligence, nor imitate external conditions. But natural music, as when a man hums, does represent moods, and may repeat what has been heard. Artistic music develops, according to the laws of form, phrases of natural music; and what these mean may be determined by the meanings of time, pitch, force and quality as manifested in intonations of speech as distinguished from the articulations of words.

Mr. R. H. Strother spoke on the 'Physics of the Phonograph,' and C. K. Wead discussed 'Modern Problems in Acoustics.'

The 518th meeting, held April 28th, was devoted to a paper by Mr. Lyman J. Briggs 'On the Absorption of Salts by Organic and Inorganic Substances,' followed by 'An Unscientific Account of a Scientific Expedition to Hawaii,' illustrated by lantern slides, by Mr. E. D. Preston and the exercises closed with a statement by Mr. R. A. Harris of 'A new way of indicating the Acceleration of a point referred to Polar Co-ordinates.' The author showed how the ordinary expression for the acceleration of a point moving in a circle, or how the resolution of the acceleration with reference to tangent and normal for any path (plain or twisted), does by its form indicate the resolution with reference to polar co-ordinates.

E. D. PRESTON,
Secretary.

NOTES ON PHYSICS.

ANALYSIS OF VOWEL SOUNDS.

PROFESSOR LOUIS BEVIER, Jr., describes in the *Physical Review*, for April, some interesting work in vowel analysis. The author magnifies the ordinary phonograph record by a mechanical-optical device, thus obtaining tracings which he subjects to harmonic analysis. He has thus far analyzed only the vowel *a* (as in father). He finds two mouth tones in this vowel. The higher and more characteristic mouth tone has a pitch of about 1150 ± 150 vibrations per second. The lower mouth tone has a pitch of about 675 ± 125 vibrations per second. The resonance corresponding to the higher tone is the more pronounced, and this tone varies less in pitch than the lower tone, with different voices.

DISSOCIATION THEORY OF THE ELECTRIC ARC.

PROFESSOR C. D. CHILD applies the theory of ionic dissociation to the explanation of some of the more prominent of the phenomena of the electric arc in the *Physical Review*, for March, 1900. Professor Child explains the curve obtained by Mrs. Ayrton (representing the fall of potential from carbon to carbon). He explains the peculiar light clouds which N. H. Brown found advancing at different velocities from positive and negative carbons in an alternating current arc, and he verifies the drag of the ions upon the vapors of the arc by the method

employed by A. P. Chattock in case of discharge from point to plate. The question of the slow decay of the e. m. f. between the carbons of an arc, after the current ceases to flow (circuit broken), can be approximately answered in terms of the ionic theory. This e. m. f. would die away as the clouds of positive and negative ions near the carbon tips diffuse towards each other. The time required for this would be in the neighborhood of $\frac{1}{1000}$ second for an arc 1 cm. long, if we assume an ionic velocity of 3000 cm. per second per electrostatic unit of potential gradient, and the value of the counter e. m. f. at the instant of breaking the circuit (which would also be the real counter e. m. f. of the arc while running) could be easily calculated from Mrs. Ayrton's curve. Thus the curvature of Mrs. Ayrton's curve is the density of charge at each point; and from this the potential fall from carbon to carbon is easily calculated.

Practically, Mrs. Ayrton's curve taken in conjunction with the ionic theory of the arc settles the perplexing question of the counter electromotive force of the arc. Consider the freshly dissociated ions along the path of the arc. The positive ions have to be hauled up by the impressed e. m. f. into the cloud of positive ions, and the negative ions have to be hauled down into the cloud of negative ions. The work so spent is reversible, except that energy is being continuously dissipated at the carbons, as the ions in the clouds lose their charges. A small amount of energy is also dissipated because of the viscous drag of the arc vapors upon the ions. W. S. F.

CURRENT NOTES ON PHYSIOGRAPHY.

SHORELINE TOPOGRAPHY.

A SUCCESSFUL attempt has been made by F. P. Gulliver to trace a sequence in the development of shoreline forms, distinguishing those which are produced in the earlier stages from those which characterize the later stages of what may be called the 'shoreline cycle.' A large number of littoral forms recorded on maps from all parts of the world were thus classified in accordance with the processes of marine erosion as determined by local observation and general study, the results of the work appearing in a thesis entitled: 'Shoreline Topography' (*Proc. Amer. Acad.*, xxxiv, 1899, 177–258, 32 figures.) The author considers first the shorelines due to relative change of level of land and sea, and as yet essentially unmodified by sea action: these are the initial forms, on which the agencies of change then proceed to develop a long series of sequential forms, until interrupted by later movement. Systematic description and explanation is thus given to a large number of shore forms, such as cuspate forelands, off-shore bars, bars by which islands come to be tied to an adjacent mainland, bay-bars, spits, deltas, cliffs, and so on. Under each heading, a type example is selected and usually figured; additional examples are serviceably indicated by specific references to maps from many coasts. A bibliography of 100 titles is appended.

SHORE FORMS IN THE BRAS D'OR LAKES.

TARR'S account of cuspate forelands in the Bras D'Or Lakes of Cape Breton Island (*Amer. Geol.*, xxii, 1898, 1–12), is followed by a similar paper by Woodman (*Amer. Geol.*, xxiv, 1899, 329–342), describing additional shore features of the same irregular water bodies, where cusps, looped bars, single and double tombolos, and bars across the mouth, middle and head of bays are developed in remarkable variety. Through both these papers there seems to be some misapprehension of the share of work in making cuspate forelands attributed to waves and currents by Gulliver in his essays on the topography of the shore line (Cuspate forelands, *Bull. Geol. Soc., Amer.* vii, 1896, 399–422, and Shore-line Topography, as above). The former authors explain the cusps that they observed solely by what they regard as wave-action. The latter author refers the 'long-shore transportation that is involved in the production of cusps to currents which, in inland and tideless water bodies, he regarded as of wind origin. In so doing, it does not seem to have been his intention in the least to exclude from waves the power of moving shore materials, but to analzye the forces acting on a shore, much as had been done some years before by Gilbert, who wrote: "Usually, and especially when the wind blows, the water adjacent to the shore is stirred by a gentle current flowing parallel to the water margin. This carries along the particles of

detritus agitated by the waves. The waves and undertow move the shallow water near the shore rapidly to and fro, and in so doing momentarily lift some particles, and roll others forward and back. The particles thus wholly or partially sustained by the water are at the same moment carried in a direction parallel to the shore by the shore current. The shore current is nearly always gentle and has of itself no power to move detritus" (*U. S. Geol. Surv.*, Monogr. i, 37). Tarr describes 'Shore currents of wind drift origin' in Cayuga Lake, and Woodman recognizes in the Bras D'Or Lakes, 'currents caused by the unobstructed forward movement of the top water under wave growth and motion, and lasting little if any time after the cessation of the wind.' It is precisely these currents which Gilbert and Gulliver seem to have had in mind as determining the direction of 'long shore transportation of gravel and sand, jostled by the waves. All may agree with a later writer that "one will never find [these] currents of sufficient power to transport pebbles,' if the currents are considered apart from the waves; but some might not agree with another writer that such currents should be classed 'under the general head of wave action." Certainly it is by wave action that a cobble is thrown upon the beach; but the systematic forms assumed by cusps and bars, of which the beach is but the higher part, suggests a control by the slow movement of a large body of water. The similarity between large cusps, such as Capes Lookout and Hatteras where the action of 'long-shore currents can hardly be doubted, and the small forms of the Bras D'Or lakes where the 'long-shore currents must be very weak, suggests that the processes of origin should be similarly analyzed for both large and small forms.

GLACIAL EROSION IN THE GREAT GLEN OF SCOTLAND.

W. T. BLANFORD, veteran geologist of India, writing "On a particular form of surface, apparently the result of glacial erosion, seen on Loch Lochy and elsewhere" (*Quart. Journ. Geol. Soc.*, lvi, 1900, 198–204), suggests that glacial action has strongly deepened the floor and smoothed the sides of the Great glen of Scotland. It is inferred that in preglacial time the streams of lateral glens were separated by advancing spurs which buttressed the sides of the Great glen. Now the spurs seem to have been truncated, producing the smooth and even sides of the glen, to which attention is especially directed. The lateral glens at present open 1000 feet above the floor of the Great glen, whose smoothed sides are very little eroded by the descending tributary streams. The change from the inferred preglacial form is taken to indicate glacial erosion of at least 250 or 300 feet of rock.

Main valleys thus affected by glacial erosion are called 'over-deepened valleys' by Penck, because they frequently contain lakes, and because their slope is often so gentle that the streams which now occupy them must aggrade their floor. The lateral valleys that open in the wall of the main valley at a considerable height above its floor, so that the side streams cascade into the main valleys, are called 'hanging valleys' by Gilbert, who has described many examples in an address on the Harriman Alaskan expedition (not yet published). Gannett has clearly explained the relation of hanging side valleys to their overdeepened main valleys in his account of Lake Chelan (*Nat. Geogr. Mag.*, ix., 1898, 417–428), in which the analogy between the valleys and beds of rivers and glaciers was clearly pointed out in terms very similar to those independently stated by Penck a year later (see SCIENCE, January 5, 1900, 34). An account of the overdeepened valleys of the Ticino in the Southern Alps is given by the undersigned in *Appalachia*, ix, 1900, 136–156.

W. M. DAVIS.

ANTIQUITIES OF ALABAMA.

'CERTAIN Aboriginal Remains of the Alabama River,' is the title of a paper by Mr. Clarence B. Moore, of Philadelphia. This memoir occupies pages 289 to 347 of Volume XI., 1899, of the *Journal of the Academy of Natural Sciences* of Philadelphia and is also issued as a bound reprint of same date. P. C. Stockhausen, the publisher, has left us nothing to wish for in paper and imprint. Sixty-nine illustrations of pottery, shell, stone and copper objects, a

map of the Mobile and Alabama river region and an index accompany the text.

Some of the copper pendants figured are of exceeding interest. Pipes of earthenware, fish-hooks of shell and bone, disks probably for the ear lobe, incised shell disks and the decoration on the pottery are all worthy of study.

The author states that although the attention given by him to the Mobile and Alabama rivers does not compare with that accorded by him to the St. Johns river, Florida, and to the Georgia coast, yet it was fully ample to indicate that mounds along these rivers were of rare occurence and, as a rule, insignificant in size. He suspects that at many places the people were buried in cemeteries and that these being unmarked have largely escaped notice. The borders of Mobile and Alabama rivers were probably not so thickly settled as the St. Johns. This may be due to the fact that shad, bass and shell-fish are less abundant in the former. The shellheaps are insignificant compared with those covering acres along the St. Johns. Swamps and malaria may also have had their influence.

Quartz is more used than chert for points, a reverse of the facts for Florida and Georgia coast. The earthenware, although good and often tempered with shell, was not striking in type. In some of it Tennessee and Mississippi Valley influence is suggested.

The gritty ware of lower Georgia and its complicated stamp decorations were rare, but some sherds bearing decorations of the kind found in Georgia, Carolina and upper Florida were found. None of the highest type of gulf-ware was met and perforations for suspension were not common.

Plural burials of uncremated bones in single urns proved a fact new to science for the south-east, although plural burials of cremated bones may have been known. One case of cremation was found which, while almost totally foreign to this region, is frequently met in Florida and Georgia.

Mr. Moore's investigations are the first of a systematic nature to be carried on along the Mobile and the Alabama. This record of the results is a most happy addition to the already valuable Floridian library from his pen.

Harlan I. Smith.

A NEW PALEOLITHIC STATION.

A discovery of unusual importance is announced in the *Correspondenz-Blatt der deutschen Gesellschaft für Anthropologie, Ethnologie und Urgeschichte* for March. The announcement, as well as the discovery, is by Professor Gorjanović-Kramberger, Director of the National Museum of Geology and Paleontology at Agram, capital of Croatia, Austria-Hungary. The find was made on the bank of the Krapina, a small stream in northern Croatia, and consists of the paleolithic remains of man (pieces of the jaw bone with teeth, isolated teeth, parietal and occipital fragments, etc.), and chipped implements of stone, associated with Rhinoceros tichorhinus, Bos primigenius, Ursus spelæus, Sus, Castor fiber, etc.

These culture-bearing deposits, nine zones in all, occur in what might be called a rock shelter of stratified Miocene sandstone. Of the nine zones, the lowest only shows evidence of stream-action, and that at a time when the water-level was considerably higher than now. The eight superimposed layers are products of weathering from the overhanging Miocene sandstone. The thickness of the entire deposit measures 8.5 meters. The above mentioned animal remains occur throughout the series of layers, at the same time, on account of the relative frequency of certain remains, three faunal horizons are readily determined:

1 Castor fiber,
3-4 Homo sapiens,
9 Ursus spelæus.

It is pointed out that horizon 3–4 contains burnt human as well as animal bones. The bones are bright yellow and very friable, the phalanges and teeth alone being well preserved. The station has produced in all, more than one thousand fragments of bone. Unfortunately, the preliminary report gives little idea as to the character of the industry except to say that the implements are angular pieces of jasper and opal.

The appearance of charcoal, ashes, burnt sand, stone implements and bone fragments all the way from the second to the ninth and top-most layer, and the relatively large proportion of the human to the animal remains, will tend to increase the interest in Dr. Gorjanović-Kram-

berger's forthcoming, detailed and fully illustrated account.

GEORGE GRANT MACCURDY.
YALE UNIVERSITY.

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*CERTAIN LAWS OF VARIATION.**

IN a former paper† it was shown that the ova of the Echinoid *Strongylocentrotus lividus* were extraordinarily sensitive to their environmental conditions at the time of impregnation. For instance, by keeping the mixed ova and sperm in water at about 26° or 28° C. for an hour, the plutei obtained after eight days' development were some 5 per cent. smaller than those from ova kept at about 20° at the time of impregnation.

These observations were repeated and confirmed, in the case of *Sphærechinus granularis* as well as *Strongylocentrotus*, and others were made upon the reaction of *Strongylocentrotus* to environment in the later stages of their development. Thus after keeping the ova at a normal temperature for an hour at the time of impregnation, a portion of them was exposed to an abnormal temperature. After a few hours some of these were re-transferred to water at a normal temperature, and kept there for the remainder of development. A few hours later, some more of them were transferred, and so on. By measuring the larvæ after six or eight days' growth, the effect produced by various periods of exposure was determined. When the 'normal' temperature was 20° and the abnormal about 8°, it was found that the larvæ were diminished on an average 1.3 per cent. for each hour's exposure between the end of the 1st to the end of the 6th hour after impregnation; 0.3 per cent. for each hour between the 6th and 10th hours; and 0.2 per cent. for each hour between the 10th and 21st hours. When the 'normal' temperature was about 13° and the 'abnormal' about 20°, an increase in size was produced, amounting to 1.1 per cent. per hour during the 5th hour after impregnation; 0.4 per cent. during the 14th hour; 0.13 per cent. during the 46th hour, and 0.01 per cent. during the 120th hour. That is to say, in each case *the effect of temperature on the growth diminished regularly and rapidly from the time of impregnation onwards.*

When the ova were exposed to an abnormal temperature of 26°, an adverse effect of 4 per cent. was per hour produced during the first three hours. For the next four hours the effect was almost *nil*, and after that a *favorable* effect on growth ensued. This was about 0.4 per cent. per hour for the 16th hour, and 0.01 per cent. for the 80th hour. This change of reaction was accounted for by the fact that the fatal temperature, and therefore also the temperatures unfavorable to growth, rise during development. Thus the death temperature is 28.5° for ova, 33.5° for four hours' blastulæ, 36.5° for 12 hours' blastulæ, and 40.3° for six days' plutei.

The effect of change of salinity on the growth was also found to diminish rapidly with progress of development, hence probably a similar relationship would show itself for other conditions of environment.

What is true for echinoids is probably true for most other organisms, or is, in fact, a law of general application. Thus in man the rate of growth during the third week of embryonic existence is about 2400 times greater than between the 13th and 19th years of post-natal development. The reaction to environment must also be much greater during the earlier period, therefore, though not in the same proportion. Thus, in that the variability diminishes considerably during development—Minot has shown that it becomes halved through the post natal growth of guinea-pigs—retardations or accelerations of growth produced in the young animals must also become partly wiped out by the time the adult stage is reached.

By splitting up into groups the 20,600 measurements which have been made from time to time on *Strongylocentrotus* larvæ, according to the amount of effect which had been produced in their size by varying degrees of favorable and unfavorable environment, and by determining the average variability of the larvæ in each group, it was sought to prove the existence of a law of variability. This may be worded as follows: "An organism varies least

* Abstract of a paper read before the Royal Society on March 29, 1900, by Dr. H. M. Vernon, Fellow of Magdalen College, Oxford.

† *Phil. Trans.*, B, 1895, p. 577.

when it is best adapted to its surroundings, so that the less it is adapted, the more variable does it become.''

SCIENTIFIC NOTES AND NEWS.

THE Committee of Coinage, Weights and Measures of the House of Representatives has unanimously agreed to report as an amendment to the Sundry Civil Bill the measure establishing a United States Standardizing Bureau. A full account of this important measure was published in the issue of this JOURNAL for May 4th.

IN accordance with the recommendation of the Rumford Committee, the American Academy of Arts and Sciences has voted to award the Rumford Medal to Professor Carl Barus of Brown University for his various researches in heat.

THE Academy has further granted from the Rumford Fund the sum of $230 to Mr. Arthur L. Clark of the Worcester Academy in furtherance of his research on the 'Molecular Properties of Vapors in the Neighborhood of the Critical Point.'

Two excursions were recently given under the auspices of the Geological Department of the Johns Hopkins University, in honor of Professor W. C. Brögger, of the University of Christiania, Norway, who completed, May 3d, his course of George Huntington Williams Memorial lectures on the Principles of Geology at the Johns Hopkins University. The first excursion was made upon the State steamer *Governor McLane* to southern and eastern Maryland to examine the several formations of the Coastal Plain, and was participated in by Mr. S. F. Emmons, of the U. S. Geological Survey; Professor B. K. Emerson, of Amherst; Profes- J. A. Holmes, of North Carolina, and Professors William Bullock Clark, Joseph S. Ames and Harry Fielding Reid, of the Johns Hopkins University. Several days were spent along the estuaries of the Chesapeake Bay in studying Cretaceous and Tertiary deposits.

ANOTHER excursion was organized by Professor Clark at the close of Professor Brögger's lectures on May 4th, the steamboat of the General Manager of the Chesapeake and Ohio Canal being placed at the command of the party, who made an all-water trip from Washington to Cumberland, in the heart of the Allegheny Mountains, spending six days *en route* in the study of the rocks of the Piedmont Plateau and the Appalachian Region, and subsequently passing a day as the guests of the Western Maryland Companies, studying the coal deposits of the Georges Creek Basin. Hon. C. D. Walcott, Director of the U. S. Geological Survey, and Messrs. Arnold Hague, C. W. Hayes, Bailey Willis and Arthur Keith, of the same organization, and Professors Clark, Reid and Matthews participated in this excursion.

THE Franklin Institute has awarded an Elliott Cresson medal to Professor W. O. Atwater and Mr. E. B. Rosa for their respiration calorimeter.

PROFESSOR R. W. WOOD, of the University of Wisconsin, has been elected a fellow of the London Physical Society.

MR. CARL HERING has been appointed a member of the jury of award for the electrical group of the Paris Exposition.

MR. S. HARBERT HAMILTON, former Jessup scholar in geological chemistry at the Academy of Natural Sciences of Philadelphia, has accepted a call to the Museum of Geology and Archæology of Princeton University.

GEORGE GRANT MACCURDY, instructor in prehistoric anthropology at Yale University, has been made a corresponding member of the Society of the Institute of Coimbra, a society especially interested in developing literature, science and the liberal arts. Coimbra was once the capital of Portugal and is still the seat of its only university, an institution founded in 1290.

THE seventieth anniversary of the birth of Dr. A. Jacobi, clinical professor of the diseases of children in Columbia University, was celebrated by a banquet in New York City on the evening of May 5th. Addresses were made by Dr. Joseph D. Bryant, Dr. William H. Thomson and Dr. Carl Schurz, and a poem by Dr. S. Weir Mitchell was read. A 'Festschrift' was presented to Dr. Jacobi, containing scientific contributions from fifty-three medical men representing eleven nations.

THE death is announced of M. Edouard Grimaux, the eminent chemist, member of the Paris Academy of Sciences and professor in the Polytechnic School of Paris, until deprived of this office by General Billot for maintaining his belief in the innocence of M. Dreyfus. We have no information that the wrong done him on that occasion had been repaired in view of the more recent developments. M. Grimaux's numerous publications include 'Equivalents, atomes et molécules' (1866), 'Chimie organique' (1872–1878), 'Chimie inorganique élémentaire' (1874–1879), 'théories et notations chimiques' (1884), and 'Lavoisier.'

DR. LANGDON-CARTER GRAY of New York City, a specialist in nervous and mental diseases and a past president of the American Neurological Association, died on May 8th at the age of 50 years.

THE death is announced of Dr. George Viner Ellis, who held the chair of anatomy in University College, London, for twenty-seven years and was the author of several works on human anatomy. He became a member of the Royal College of Surgeons 65 years ago.

THE Senate Committee on Commerce on May 10th agreed to report the Philadelphia Commercial Museums Bill carrying an appropriation of $200,000.

THE mansion of P. A. B. Widener, at Broad Street and Girard Avenue, Philadelphia, was presented to the city on May 8th to be used as a free library and art gallery. The gift is valued at $1,000,000, and it is said that Mr. Widener intends to endow the institution amply.

THE forty-first meeting of the American Society of Mechanical Engineers was held at the Grand Hotel, Cincinnati, O., May 15 to 18, 1900.

THE *Geologische Reichsanstalt* of Vienna will commemorate the fiftieth anniversary of its foundation at a meeting to be held on June 9th.

THE German Congress of Medicine which has been holding its sessions at Wiesbaden will meet next year at Berlin under the presidency of Professor Senator. In the German Surgical Congress Professor Czerny has been elected president in succession to Professor von Bergmann.

Two hundred and sixteen cases of the plague have now been reported at Sydney, of which number one-third were fatal. Twenty cases including thirteen deaths have been reported at Port Said. The disease shows no abatement in India. During the last week regarding which records are at hand there were in the Bombay Presidency 730 deaths, in Karachi 315 deaths, in Calcutta 648 deaths, and in Hong Kong the disease was increasing. Cholera is seriously epidemic in the famine districts of India.

THE *British Medical Journal* reports that all the arrangements have now been made for the carrying out of the experiments as to the prevention of malaria which were referred to by Dr. Manson in his address before the Colonial Institute. A mosquito-proof malaria hut has been constructed by Messrs. Humphrey, of Knightsbridge, and will be sent out to Italy about the first week in May. The experiments, the cost of which is to be defrayed by the Colonial Office, will be begun in June and continued till October, thus covering the malaria season. Dr. Luigi Sambon, lecturer of the London Tropical School of Medicine, and Dr. G. C. Low, a distinguished student of the school, have volunteered to be the subjects of the experiment by occupying the hut throughout the period indicated. Their business will be to keep themselves from being bitten by mosquitoes. Professor Celli has kindly offered every assistance in furtherance of the experiments, and will select a site for the huts within the area of his own field of experimental work on malaria. The Italian government has also expressed its sympathy with the objects of the expedition, and Professor Baccelli has promised his assistance. A series of correlative experiments will be made in England by exposing healthy Britons to the bites of malaria-infected mosquitoes, which will be supplied for the purpose by Professors Bignami and Bastianelli, of Rome. In this case, too, several persons have already offered themselves as subjects of the experiments, including a son of Dr. Manson's.

THE report of the Corporation of Glasgow on the Museums and Art Galleries, for 1899, shows

the continued interest of the public in the four institutions embraced under the above title, for while the attendance was not so large as in 1898, it was something over 898,000. The growth of the collections is pretty evenly divided between art and science, the most important acquisition during the year being a collection of fossils obtained from the Geological Society of Glasgow.

At the monthly meeting of the British Astronomical Association, on April 25th, some statements, reported in the London *Times*, were made regarding the arrangements for observing the total solar eclipse of May 28th next. A party, of which the Rev. J. M. and Miss Bacon, and Mr. and Mrs. Nevil Maskelyne will be members, will go to Wadesboro, in North Carolina; Mr. and Mrs. E. W. Maunder, Mr. and Mrs. Crommelin, Mr. Evershed, and others, will go to Algiers; and Mr. G. F. Chambers and others to Portugal. In describing the proposed work of the expedition to the United States, Miss Bacon said that Mr. Nevil Maskelyne, assisted by Mrs. Maskelyne, would direct the telescopic kinematograph upon the corona throughout totality, and expose a long film in an ordinary kinematograph camera directed towards a chosen point of the landscape for a period commencing somewhat before and terminating somewhat after totality. The Rev. J. M. Bacon, with a telescopic camera, would photograph the inner corona as at Buxar, India, in 1898, the exposures, however, being shorter, and the development more prolonged. He would endeavor to make these exposures at definite and exact moments symmetrical with reference to mid-totality to aid in determining the relative position of sun and moon. He would also expose to the zenith for several minutes before, during, and after totality, a long sensitive film, continuously driven in a especially designed automatic instrument. By means of a kite he would compare during the eclipse the temperature at an altitude of a few hundred feet with that on the ground. Miss Bacon said that she would endeavor to photograph the outer corona and extensions, and would also repeat her former experiment of taking a 'gathering gloom' series. Special observations of shadow bands would be organized, these including a proposal to pursue them along a white road by a party of cyclists. Photographic tests would be adopted as at Buxar to compare the light of the corona with that of the full moon. Miss Bacon mentioned that the Pennsylvania Railroad authorities had kindly promised special concessions for the occasion. The United States Naval Department had intimated that the instruments would be admitted into the country free of charge and of examination; the Canadian government had granted similar facilities should the expedition pass into Canada, and the British government had done the same in respect of the return to England, so that much inconvenience and risk to photographic material and instruments generally which would otherwise be experienced would be avoided. Professor Young, the eminent solar authority, who, with his party from Princeton, had chosen the same station, Wadesboro, had offered them every assistance in his power.

The annual meeting of the members of the Royal Institution was held on May 1st. The annual report of the Committee of Visitors for the year 1899, testifying to the continued prosperity and efficient management of the Institution, was read and adopted, and the report on the Davy Faraday Research Laboratory of the Royal Institution, which accompanied it, was also read. Sixth-three new members were elected in 1899. Sixty lectures, 17 evening discourses, and two centenary commemoration lectures were delivered in 1899. The books and pamphlets presented in 1899 amounted to about 280 volumes, making, with 672 volumes (including periodicals bound) purchased by the managers, a total of 952 volumes added to the library.

The Association of Economic Entomologists will as usual hold its annual meeting in conjunction with the American Association for the Advancement of Science. It will meet at Columbia University, New York City, on June 22d and 23rd. A joint session with the Society for the Promotion of Agricultural Science will be held on the morning of June 23rd. Members of the Association are requested to send to

the Secretary, Mr. A. H. Kirkland, Malden, Mass., at their earliest convenience, titles of papers that they desire to read.

THE council of the Royal Geographical Society has awarded the two Royal Medals for this year to Captain H. H. P. Deasy and Mr. James McCarthy. The Founders' Medal has been awarded to Captain Deasy for the exploring and survey work which he has accomplished in Central Asia during two expeditions lasting three years altogether. He was incessantly engaged in surveying in districts where an experienced professional surveyor would find exceptional difficulties. As tested by the Indian Survey Department, his mapping is scientifically constructed on thorough survey principles. His observations on the great extent of country traversed and on the people are of high geographical value. Mr. McCarthy is the Government Surveyor of Siam, and the Patron's Medal has been awarded to him for his great services to geographical science in exploring all parts of the Kingdom of Siam, for his laborious work during twelve years in collecting materials for a map, to form the basis of a survey system, and for his admirable map of Siam just completed. The other awards have been made as follows: The Murchison award to M. Henryk Arctowski for the valuable oceanographical and meteorological work which he performed on the Belgian Antarctic expedition; the Gill Memorial to Mr. Vaughan Cornish for his researches, extending over several years, on sea-beaches, sand-dunes and on wave-forms in water; the Back grant to Mr. Robert Codrington for his journeys in the region between Lakes Nyassa and Tanganyika, during which he removed, on behalf of the Society, the section containing the inscription from the tree under which Livingston's heart was buried; and the Cuthbert Peek grant to Mr. T. J. Alldridge for his journeys during the past ten years in the interior of Sierra Leone, during which he has done valuable geographical work.

THE 71st anniversary meeting of the Zoological Society of London was held on April 30th. The report stated that the income had been £28,879, a decrease of £328 as compared with that for 1898. The average annual receipts of the Society for the previous ten years had been £26,370. The ordinary expenditure of the Society for 1899 had amounted to £26,884, an increase of £904 over that of the previous year. Besides this a sum of £2537 had been paid and charged to extraordinary expenditure, having been devoted mainly to the construction of new buildings in the gardens and to the acquisition of a young male giraffe. After payment of the ordinary and extraordinary expenditure a balance of £1043 had been carried forward. The number of visitors to the gardens in 1889 had been 696,707, being 14,241 less than the corresponding number in 1898. The number of animals living in the Society's gardens on December 31st last was 2753, of which 821 were mammals, 1471 birds, and 461 reptiles and batrachians. Amongst the additions made during the past year 13 were specially commented upon as being of remarkable interest and in most cases new to the Society's collection. Of these by far the most noticeable objects exhibited for the first time were the splendid pair of Grévy's zebras, placed under the care of the Society by the Queen on August 14, 1899. These animals had been presented to her Majesty by the Emperor Menelek, of Abyssinia. The Council also called special attention to the young male giraffe, acquired on April 1, 1899, by purchase for £800. It was believed that this animal, together with the female purchased in 1895, formed the only pair of young giraffes now to be found in any of the zoological gardens in Europe. The meeting elected the new members of the Council and the officers for the ensuing year as follows: Lord Avebury, Mr. William Bateson, F.R.S., Sir Joseph Fayrer, F.R.S., Mr. P. Chalmers Mitchell and Mr. Oldfield Thomas to the Council in the place of the retiring members, and the Hon. Walter Rothschild, M.P., Professor George B. Howes, F.R.S., and Lieutenant-Colonel Leonard H. Irby re-elected. The Duke of Bedford was re-elected President, Mr. Charles Drummond, Treasurer, and Mr. Philip Lutley Sclater, F.R.S., Secretary.

PROFESSOR FREDERICK STARR, of the University of Chicago, has returned from his tenth journey of study and investigation in Mexico. The expedition was assisted by Mrs. Frank G.

Logan, of Chicago. The chief object in view was to study the physical types of the Indians of southern Mexico. This study, begun two years ago and carried on by Professor Starr in his last two journeys, makes use of three methods of investigation—measurement, photography and plaster work. In each tribe visited, measurements are made upon one hundred men and twenty-five women—fourteen different measures being taken of each subject. Photographs are made of good types, a front and profile view being made of each. Views are also made of scenery, towns, groups, houses, occupations, etc., etc. Five persons of each tribe —notable types—are subjected to the operation of bust-making; plaster mixed with water is applied directly to the subject to form a waste-mold in which the bust is afterwards run. Five tribes were examined — the Chinantecos, Chochos, Mazatecos, Tepehuas and Totonacos. These tribes are conservative and clannish and all retain their own languages, although Spanish is understood to some extent in all their towns. Of the Tepehuas, whose linguistic relationship has been uncertain, a fair vocabulary was secured. The survival of the ancient art of beating paper from the bark of trees, was investigated among the Otomis in the mountains of the states of Hidalgo and Pueblo. The survival of the pagan practices among the Tepehuas and Otomis of the same district was somewhat studied. Several days were spent among the Tlaxcalan villages on the slopes of Mount Malintzi and many curious data were secured relative to life and customs. Other minor but interesting studies were made. It is hoped that the results of the expeditions may all be printed within the next two years. The party consisted of four persons—the director, the photographer, Louis Grabic; the modeler, Ramon Godinez, and a helper, Manuel Gonzales. The expedition involved five hundred miles of horseback riding in the most mountainous regions of the states of Oaxaca, Hidalgo and Puebla. Of the tribes visited the Chinantecos and Tepehuas were the most interesting and best known. Professor Starr hopes to complete his work next year by a study of the tribes of the Huaxteca, Chiapas and Yucatan.

At an extra meeting of the British Institution of Civil Engineers, held in April at its house in Great George-street, the eighth 'James Forrest' lecture was delivered by Sir William Preece, the subject being the 'Relations between Electricity and Engineering.' According to the London *Times* the lecture began with a statement of four fundamental principles underlying the practical applications of electricity and illustrated them with some elementary experiments. Sir William Preece pointed out that electricity was purely mechanical in its effects. It required matter to render it evident to the senses. Its transference was characterized by motion, chiefly undulatory as regards the ether, but partaking of the most known forms as regards conductors and insulators. It was, therefore, essentially a dynamical agent in the hands of the engineer to carry out his duties. The lecturer proceeded to discuss the applications of electricity under a number of heads. Among these were the purification of matter; the annihilation of space, as for instance in the telegraph, the telephone, and the use of electrical energy to move railway signals and points; the transmission of power, including the employment of electric motors to drive the machines in manufacturies; traction, including electric railways and automobile cars, the lecturer believing that the motor-car of the future will be electrical; electricity in war; and sanitation. In conclusion he said there was now a distinct line of demarcation separating the physicist from the engineer. The former dived into the unknown to discover new truths; the latter applied the known to the service of man. Research was the function of the one, utility that of the other. In the past the engineer had to rely upon himself for his facts, but the advance of modern science, the growth of technical education, the formation of laboratories, and the endowment of chairs, had changed all that. We could scarcely hope for new sources of energy to be discovered but there were some known ones as yet untouched. When the evil day arrived for our coal supplies to give out we might perhaps be able to utilize the heat of the sun and the tides of the ocean. There was, however, a vast illimitable store of energy not only in the rotation of the earth upon its axis, but in the eternal heat of this globe itself. As

we descended below the surface the temperature became higher and higher, and it ought not to be difficult to reach such temperatures that by thermo-electric appliances we might convert the lost energy of the earth's interior into some useful electric form.

WE learn from the *British Medical Journal* that Mr. A. L. Jones, whose name has for some time been associated with the Liverpool School of Tropical Medicine, has set on foot a scheme for assisting natives of tropical colonies to go to Liverpool to study medicine and obtain a qualification to practice. The African Steamship Company has consented to convey to and from England any natives of Africa who desire to avail themselves of this arrangement at a greatly reduced cost, and it is calculated that it will be possible for them to fulfill the five years' curriculum and obtain their qualification to practice at a cost of about £600, including the passage money and the expenses of living. Messrs. Elder, Dempster and Co. have addressed a circular to the respective Governors of the West African Colonies, asking them to bring the scheme to the notice of schoolmasters and others in touch with secondary education, and seeking for information as to how far the education in the colony is organized to admit of natives being prepared for one of the preliminary examinations recognized by the General Medical Council. It is intended to include West Indian natives in the scheme.

IN presenting Mr. Charles Hose for the honorary degree of Doctor of Science at Cambridge University, the Public Orator, Dr. Sandys, stated, according to the London *Times*, that for the last ten years, Mr. Hose had been the Resident of the Baram district in Borneo, in that part of the island which was under the rule of Sir Charles Brooks, Rajah of Sarawak. As Resident, Mr. Hose had, in a masterly manner, put an end to an inveterate blood feud between two hostile tribes, and had diverted their energies from the pursuits of war by the peaceful institution of an inter-tribal boat race. At the sacrifices connected with the ratification of the treaty of peace, he had proved himself a most skillful *haruspex* by finding in the flesh of the victims omens of peace and prosperity to all the tribes of the district; while in his scientific knowledge of the birds of Borneo, he had also proved himself an *augur et auspex admirabilis*. It was under his auspices that the museums of Switzerland, Holland, Germany, France, and England had successively been supplied with many important specimens of the birds and mammals of Borneo; while his own researches had thrown a new light on the zoology, the anthropology, and the geography of the island. He had thus extended the bounds of science near the confines of the British Empire. In recognition of the value of his scientific work, he had received distinctions from the Royal Geographical Society and from other bodies, and among the honors he had received from the nations of Europe was the not inappropriate title of 'Knight of the White Falcon' of Sachs-Weimar. Lastly, for more than ten years he had been a constant and generous benefactor to the Cambridge Museums of Zoology, Anatomy, and Archæology; and, only two years ago, he had given the most cordial welcome and the most valuable assistance to the Cambridge Anthropological Expedition to New Guinea and Borneo.

THE Friday evening discourse at the Royal Institution was given on April 13th by Lord Kelvin, whose subject was 'Nineteenth Century Clouds over the Dynamical Theory of Heat and Light.' Sir Frederick Bramwell was in the chair, and among those present were Sir George Stokes, Sir Andrew Noble, Sir Frederick Abel, Sir William Crookes, Sir J. Wolfe-Barry and Sir James Crichton-Browne. Lord Kelvin said, according to the London *Times*, that there were only two clouds to obscure the beauty and clearness of the dynamical theory which might be briefly expressed by saying that heat and light were modes of motion. The first came into existence with the undulatory theory of light, and was dealt with by Fresnel and by Dr. Thomas Young; it involved the question, how could the earth move through an elastic solid, such as the luminiferous ether was supposed to be, far more easily and freely than the 'wind through a grove of trees'? This cloud hung heavy and undispersed. Some years ago Michelson made a beautiful experiment to discover whether the ether

passed freely through the earth, and *vice versa*. Lord Kelvin still hoped that it did, but from the results of that experiment, which proved that it did not, he could see no way of escape. The second cloud over the dynamical theory was the Maxwell-Boltzmann doctrine of the partition of energy. Here the outlook was less sombre. He held that mathematics had not proved the doctrine and that the doctrine was not true. Still he did not know any one but himself that attacked it, and his own views had been attacked by Poincaré, Lord Rayleigh, and other distinguished mathematicians, though none of his assailants had proved the proposition. Lord Kelvin proceeded to give some illustrations of the doctrine, and emphasized the labor and difficulty of putting it to experimental tests. Its mathematical consequences indeed sometimes appeared to be contrary to common sense, but that was not conclusive, for mathematics must never be judged by common sense. Still, within the last few months he had worked out a large number of cases and had obtained results that did not agree with the doctrine. The simple way, therefore, to destroy this second cloud on the dynamical theory was to drop the destructive general conclusion of the Maxwell-Boltzmann distribution. In conclusion, Lord Kelvin brought forward some considerations respecting the structure of the atom and the nature of the ether, regarded as a true imponderable outside the law of universal gravitation.

UNIVERSITY AND EDUCATIONAL NEWS.

THE endowment fund committee of Brown University has issued a statement of the condition of the fund. The effort to raise $1,000,000 in order to secure the conditional gift of $250,000 of John D. Rockefeller resulted in securing in cash, legacies and pledges $700,000. The remaining $300,000 must be pledged by commencement in order to make Mr. Rockefeller's gift available.

YALE UNIVERSITY has purchased land opposite the State Hospital for its medical school.

THE Cambridge University General Board proposes to establish a lectureship in ethnology for Dr. Haddon and a lectureship in bacteriology and preventive medicine for Dr. Nuttall. New lectureships in experimental physics and agricultural chemistry are also recommended.

THE *Educational Times* states that active steps are now being taken for the establishlishment of Commercial Universities at Marseilles, Hamburg, and Berlin. The advance of commercial education is very marked in Japan. The establishment of an Imperial High School of Commerce at Tokio has had such satisfactory results that a like school is now in contemplation for Osaka, and the creation of a degree of Doctor of Commercial Science is under discussion. There are four grades of commercial schools in the Japanese Empire. In schools of the second and third grades, designed for youths who have completed their fourteenth year and will devote three to five years to special study, amongst the subjects taken up we find ethics, Japanese, Chinese, and English (or other foreign language), mathematics, geography, history, economics, commercial legislation, bookkeeping, commodities, principles of commerce, business practice, and gymnastics, together occupying respectively thirty and thirty-three hours a week, with a five years' course. In the third grade correspondence and commercial arithmetic figure as additional subjects, and the whole course is more extensive.

EDWIN A. ALDERMAN, for several years president of the University of North Carolina, has accepted the presidency of Tulane University, New Orleans.

DR. CHARLES W. GREEN of Leland Stanford University, has been elected to the professorship of physiology in the University of Missouri. Dr. Green is a graduate of Leland Stanford, '92, and for the last two years has been assistant professor of physiology at that University.

HERBERT G. LORD, A.M. (Amherst), has been appointed professor of philosophy in Columbia University. He will have charge of the introductory collegiate courses.

TEACHERS COLLEGE, Columbia University, has awarded four fellowships as follows: Frank P. Bachman, A.B. (Chicago); Edwin C. Broome, Ph.B. (Brown); Rufus C. Bently, A.B. (Nebraska); John W. Hall, A.B. (Colorado).